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for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

BRIEF AND APPENDIX FOR APPELLANTS

IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA.

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COURT OF APPEALS FOR TH
DISTRICT OF COLUMBIA
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No. 8185

ERNEST W. REMBERT ET AL., *Appellants,*

v.

CONWAY P. COE, Commissioner of Patents.

Appeal from the District Court of the United States for the District of Columbia.

CLAIR W. FAIRBANK,
VIRGIL C. KLINE,
HARRY A. MITMAN,
Of Counsel for Appellants.

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IN THE

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FOR THE DISTRICT OF COLUMBIA

No. 8185

ERNEST W. REMBERT, EDWARD M. JENKINS,
JOHNS-MANVILLE CORPORATION, *Appellants*,

v.

CONWAY P. COE, COMMISSIONER OF PATENTS,
Appellee.

**Appeal from the District Court of the United States
for the District of Columbia.**

BRIEF FOR APPELLANTS.

JURISDICTIONAL STATEMENT.

This case is before the Court on an appeal (App. 90) from the United States District Court for the District of Columbia, Judge O'Donoghue sitting. The suit is under R. S. 4915, (U. S. C., Title 35, Section 63) (pleaded App. 2, ¶ 3), for obtaining Letters Patent refused by the Commissioner of Patents (App. 73). The invention is that of Ernest W.

Rembert and Edward M. Jenkins, who filed their application, Ser. No. 15,362 in the Patent Office on April 9, 1935, and duly assigned it to the Plaintiff, Johns-Manville Corporation. (App. 3, ¶ 5.)

The decision of the Board of Appeals in the Patent Office (App. 73) was not appealed to the United States Court of Customs and Patent Appeals (App. 6, ¶ 12), but within six months Appellants filed their Complaint, in accordance with the Statute.

In said patent application no claims were allowed by the Patent Office Examiner or by the Board of Appeals. The District Court in its Judgment (App. 89) dismissed the appeal as to the claims there and here involved, namely 13, 14, 16, 18, 19, 20 and 21. (For copy of claims see App. 69-72.)

A notice of appeal (App. 90) to this Court from the Judgment of the District Court was filed within thirty days after such Judgment, in accordance with Rule 10 of this Court.

The only question here involved is as to the patentability of said claims over two expired patents which concededly do not disclose Appellants' process or product, and the disclosures of neither of which were ever used, or ever commercially usable, according to the record.

STATEMENT OF THE CASE.

History of the Application.

The Rembert & Jenkins invention here involved is a Cementitious Composition and Article and Method of Making the Same.

The product or composition may be in the form of a pipe, roofing or siding shingle, corrugated board, flexible board, etc., of the asbestos fiber, Portland cement type, and made by a new process whereby many new and highly desirable advantages are achieved.

The complete Patent Office record (Plaintiffs' Ex. 1) contains many papers not pertinent to any question here involved, and therefore only certain portions of that Exhibit have been printed in the Appendix to this brief.

The application (Ex. 1, p. 1, and App. 47) was acted on by the Examiner on July 15, 1935 (Ex. 1, p. 18), 12 prior patents being cited and no claims being allowed. One of these patents was 1,003,813 to Schumacher, which is here relied upon by the Patent Office.

An amendment and argument was filed, and the Examiner again acted on the application on March 31, 1936 (p. 26), citing another prior patent.

A further amendment and argument was filed, and the Examiner on December 23, 1936 (p. 36) shifted his ground of rejection and cited 4 further prior patents in rejecting all of the claims.

A further amendment and argument was filed, together with an affidavit by Dr. Rembert, and the Examiner again acted on the case on October 18, 1937 (p. 50), and again shifted ground, citing 4 more patents. One of these was a patent to Morbelli, and one was the Sanger patent 1,223,834, here relied upon by the Patent Office.

A further amendment and argument was filed, and on June 11, 1938 (p. 60) the Examiner finally rejected all of the claims on the Morbelli patent alone, and on the Morbelli patent in view of the patent to Schumacher. In effect he withdrew the Sanger patent and all of the other 18 patents which he had previously cited, because in making his rejection FINAL he did not mention or rely on them.

An appeal was filed to the Board of Appeals, (p. 61) but before the hearing affidavits (pp. 72, 75, 78) were filed, establishing a completion of the present invention in this country by the applicants prior to the filing date of the Morbelli patent.

The application was sent back to the Primary Examiner (p. 87) who on July 15, 1939, found that the affidavits showed completion of the invention prior to Morbelli, and therefore that patent was withdrawn as a basis for rejection.

The Examiner then for the first time based his rejection upon the Schumacher and Sanger patents taken together (p. 91), but as this involved a *new* ground of rejection, a further amendment and argument was filed (p. 113), and claims 18, 19, 20 and 21, here before the Court, were presented, together with a further affidavit by Dr. Rembert, and a chart and a table referred to in the affidavit. (Ex. 1, pp. 120-127, and App. 59-68.)

The Examiner filed a Supplemental Statement to the Board, dated March 12, 1940 (App. 69-73). This included all of the claims here before the Court, and summarized the Examiner's grounds of rejection.

After hearing, the Board of Appeals on April 6, 1940 (App. 73-75) affirmed the Examiner.

A Petition for Reconsideration was filed, and the Board of Appeals on May 20, 1940 (Ex. 1, p. 173) reaffirmed its decision.

Thus it appears that it was not until after the application had been pending in the Patent Office for over four years, and after he had cited 19 other patents, rejected claims on them, and then admitted that they were not pertinent and withdrew them, that the Examiner finally took the position that the invention was not patentable over a combination of ideas disclosed in Schumacher and Sanger.

The District Court wrote no opinion; adopted the Findings of Fact (App. 87) proposed by the Solicitor for the Patent Office; refused to accept any Findings of Fact suggested by Appellants, even though the Patent Office Solicitor did not deny at the hearing that they were fully supported by the record; and entered a Judgment (App. 89) dismissing the Complaint.

Prior Commercial Practice Regarding Cementitious Products.

The only cementitious products which need be considered here are those in which either asbestos or sand is mixed with Portland cement. A wet mixture of sand and cement is commonly called a "mortar mix", and if gravel, crushed rock or cinders be added it is called "concrete". We are not here concerned with concrete in any form.

In commercial practice, the cement and either sand or asbestos are mixed with water, put in a mold or form, and densified by tamping the sand mixture or compressing the asbestos mixture. The mixture is permitted to stand for about 24 to 48 hours to permit the cement to set, and to effect what is commonly called "pre-curing". After such pre-curing, the product is sufficiently solid to be form-retaining, but has relatively little strength.

Strength is one of the most important of the desired characteristics of such products, and this is obtained by what is commonly called "curing", during which certain chemical reactions take place between the ingredients of the cement and water. The primary constituents of the cement are silicates and aluminates which are formed from the oxides such as silica (SiO_2), alumina (Al_2O_3), lime (CaO), and iron oxide (Fe_2O_3). A typical formula is given (App. 49) in Appellants' application. We are here concerned, not with any specific composition of the Portland cement, but only with the procedural steps and ingredients employed in making the mixture, and in the curing of the pre-cured form-retaining product.

Curing.

The sole purpose of the curing of the pre-cured product is to give to it the desired strength. So far as the record shows, the only method of curing ever commercially practiced, with either asbestos and cement, or sand and cement, prior to the present invention, was what is commonly known as "normal curing". This was described by Dr. Rembert (App. 13, 14) as letting the pre-cured and initially set material stand for about 28 to 30 days in a moist atmosphere, or under water, or as was sometimes done in Europe (App. 37), by saturating the air with steam, not under pressure, to make a fog which may have a temperature of around 140° F. (App. 38.)

A second method of curing had been described in the literature, and apparently had been tried out in the laboratory by various investigators (App. 24). This involved subjecting the product to the action of *steam under pressure,* which required enclosing it in an air-tight chamber. In this way curing might be effected in about 48 hours, instead of 28 to

30 days (App. 15). This method of curing, so far as the record shows, had never been used commercially for either sand-cement or asbestos-cement products prior to the present invention, in spite of the obvious shortening of the time required. The facts are briefly as follows:

Published information indicated that curing of sand-cement mixtures with steam under pressure results in an increase in strength of 10 per cent to possibly 30 per cent over that obtained by normal curing (App. 15, 16, 24), but there is nothing in the record to indicate that such method of curing was ever adopted commercially for these products.

Pressure steam curing of asbestos-cement products had never been used. This is understandable, because, instead of its acting to give a somewhat greater strength, as it does with sand-cement products, it acts directly the reverse and gives a strength to the product of less than half the strength which would have been obtained if normal curing had been employed. There is a drop in strength of about 65 per cent. (App. 15, 24.)

Table II (Exhibit 2, App. 77) shows the results of tests accurately and carefully made under Dr. Rembert's supervision and explained by him. Test specimens were made of asbestos and cement, and the tests were to determine the load, measured in pounds per square inch, required to cause the specimen to break. All of the tests of Series I and line 1 of Series II were of the same composition, namely 40 parts of asbestos fiber and 60 parts of Portland cement. All of these blocks were pre-cured for 48 hours. They were then cured under different conditions and the strength determined for each. The results set forth in the Table are briefly as follows:

	Time	Strength
Cured normally for	28 days	3830
Cured with steam under pressure for	1 hour	2740
" " " " " "	3 hours	2580
" " " " " "	6 "	2290
" " " " " "	12 "	1790
" " " " " "	16 "	1630
" " " " " "	24 "	1450

As the curing with steam under pressure for 24 hours resulted in a final strength of 1450 as compared with 3830 when normal curing was employed, it appears that there is a drop of 62 per cent in the strength factor, and the product has only 38 per cent of the strength when pressure steam curing is employed that it would have had if normal curing had been employed.

Thus, curing with steam under pressure somewhat increases the strength of sand-cement mixture and greatly decreases the strength of an asbestos-cement mixture. This is shown by lower curve of Fig. 1 of the application (App. 57). Therefore, for the latter, steam pressure curing was entirely impractical (App. 16), and was something that the industry knew it should avoid (App. 18) because of the disastrous effect from the strength standpoint.

From the foregoing facts it would be a natural assumption that an increased strength in an asbestos-cement mixture might be obtained by substituting a sand-cement mixture in place of the Portland cement to bind together the asbestos fibers, and by curing with steam under pressure. Surprisingly, it does not work out that way, and there is still the drop of over 60 per cent in strength, when curing asbestos-sand-cement mixtures with steam under pressure. If one omits the asbestos (which is a strength-giving ingredient) from such a sand-cement-asbestos mixture, there is an increase in strength on pressure steam curing (App. 17).

Sand-cement and asbestos-cement products differ in another important particular. In a sand-cement product, an increase in the percentage of cement in the product increases the strength until the strongest product is one of pure cement with no sand. (App. 16) It is only economic considerations which dictate the use of sand, and even gravel or crushed rock in concrete. In such products the desired strength is obtained by embedding steel reinforcing rods in the mixture.

In an asbestos-cement product, an increase in the amount of cement over that required to fill the voids between the fibers and bind them together, acts directly opposite to an increase of cement in a sand-cement mixture, and gives a decrease in strength. (App. 17.)

THE PRIOR PATENTS RELIED UPON BY THE PATENT OFFICE.

Schumacher Patent 1,003,813 (App. 83).

Schumacher in his patent 1,003,813, issued over 30 years ago, and expired September 19, 1928, taught how products made of sand and cement could be improved to some extent, so far as strength is concerned. Schumacher stated (App. 83, lines 11 to 16), that it was "known" that the addition to a standard *sand-cement* mixture (one part Portland cement and two parts sand) of certain quantities of quartz powder (another name for finely divided silica) would increase the strength obtained.* As previously noted, curing sand-cement mixtures with steam under pressure does give some increase in strength.

Schumacher's invention involved merely employing these two steps with a sand-cement mixture. He got his increase in strength by adding the fine silica to the mixture *and* curing with steam under pressure (claim 1). He stated that thereby he might use less cement. (App. 83, line 47.)

Dr. Rembert, who is not only a well educated chemist with his Doctor's degree from Massachusetts Institute of Technology, (App. 12) but has a considerable knowledge of the history of the industry (App. 38), testified that the Schumacher patent was not in commercial use when the present application was filed, and the process described in the patent had never to his knowledge been mentioned in the literature (App. 25), even though the patent has been issued over 30 years. This patent, and particularly the ratio of silica to sand disclosed, will be further referred to at a later point in this brief, and in connection with the question of anticipation of the invention here involved.

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* From Dr. Rembert's testimony (App. 16) it appears that Schumacher was in error on this point.

Sanger Patent 1,223,834 (App. 85).

Sanger claims that by adding anhydrous silica to an asbestos-cement mixture he could increase the strength. He refers to previous disclosure of the use of quartz powder (App. 85, line 26), apparently referring to Schumacher, but nowhere does he say that he proposes to use finely divided silica or quartz powder. He says "anhydrous silica" (App. 85, lines 16, 72, 99; App. 86, lines 1, 20, 35), and in one place "precipitated silica" (App. 85, line 86), but nowhere does he indicate any particular state of subdivision. He does not indicate that his anhydrous silica is any more finely divided than is sand, which is also anhydrous, and as previously noted, is generally substantially pure silica.

After adding the required amount of water to the mixture of cement, asbestos and anhydrous silica, and compressing the product to force out the excess of water, he says the "highly pressed article is treated with steam" (App. 86, line 15). It is important to note that he does not say "steam under pressure", and obviously intended merely such steam as is required to create a fog and keep moist the atmosphere in which the article undergoes normal curing, which is a standard European practice (App. 37).

Even the use of steam of any kind is of such little consequence in his process that only once (App. 86, line 15) is steam mentioned in the description of his process, where he says "treated with steam". Steam is mentioned in only two of the eight claims of the patent (claims 4 and 5), but "anhydrous silica" is mentioned in all of the claims.

It is clear that Sanger did not contemplate using steam under pressure.

Schumacher had shown that there is a

> "chemical reaction between the cement and the quartz (silica) in the presence of steam under pressure" (App. 83, lines 52-54).

Sanger does not claim any such effect of the steam. Although he states that this steam effects "silification in the surface portion" (App. 86, lines 16, 17), he definitely states:

> "The anhydrous silica remains in the finished shingles unchanged throughout except at the surface" (App. 85, lines 99-101).

He claims that there is some chemical combination between his "anhydrous silica" and the ingredients of the cement. This is not due to the steam he uses, but is due to the later exposure to the atmosphere, because he says that due to the

> "action of atmospheric water upon the finished articles" (App. 85, lines 91, 92)

* * * * * * *

> "the uncombined silica in the presence of water will further combine with the bases mentioned above (those of cement) while the simpler silicates may be transformed into more complicated silica compounds". (lines 94-98).

This action of the air, as distinguished from the action of any steam, is essential, as he specifically claims that

> "insoluble silicates of the earthy alkaline bases are produced in the surface portion when exposed to the action of atmospheric moisture and carbonic acid gas." (App. 86, claim 8.)

Even in the single instance where he does refer to his treatment with steam (App. 86, line 15), it is not the action of the steam, but the later action of atmospheric air, which

> "finally results in the formation of silicate of calcium by combining with the lime of the cement." (lines 17-19).

Dr. Rembert noted (App. 37) that nowhere does Sanger mention the use of steam under pressure; that if Sanger had used steam under pressure the strength of the product would have been only half that obtained by normal curing with air moistened with injected steam, and that the strength would have been less with normal curing than it would have been with the silica omitted, because any addition of silica to an asbestos-cement mixture, and normally curing, reduces the strength. (App. 16)

Sanger definitely represents a step backward in the art. (App. 26)

It is further important to note that although the Sanger patent was assigned to Asbestos Slate Roofing Manufacturing Company, Incorporated, as shown in the heading to the patent, and although the patent relates particularly to the manufacture of roofing (App. 85, line 14), there is nothing in the record to indicate that the process of the Sanger patent ever went on the market, and Dr. Rembert, who is thoroughly familiar with asbestos shingle manufacture, never heard of any such product. Although the patent expired April 24, 1934, and the process of that patent is open to the public, no asbestos shingle manufacturer has seen fit to adopt the Sanger process. (App. 38)

Mr. Baldwin never heard of any product made under the Sanger patent (App. 43), and no product made in competition with Appellants' product follows the teachings of the Sanger patent. (App. 45)

The Problem Before the Industry When the Present Invention Was Made.

Products made of asbestos and cement had been on the market for many years before the date of the present invention, and included shingles and pipes. In shipping them by freight, in loading and unloading, and in securing them in position, and in use, they were subject to a wide variety of stresses and strains which might break or crack them, and therefore they had to be made comparatively thick. The prior shingles would expand and contract, and would warp or curl under changes in atmospheric conditions to which they were subjected.

The main problem was as to how asbestos-cement products could be made stronger for the same weight and thickness, or thinner and of less weight for the same strength, so as to reduce freight charges and increase the ease of handling and applying at the point of use. Another problem was as to how to reduce the amount of expansion, contraction and warping, and to improve corrosion resistance.

The facts, as the industry knew them, or could have ascertained them by tests and trials, were:

1. Asbestos-cement products should not be cured with steam under pressure because it would result in a loss of over 60 per cent of the strength obtained by normal curing.

2. An asbestos-cement mixture should not have fine silica added and be normally cured (the only kind of curing ever commercially used), because it would reduce the strength, and the more silica added, the lower would be the strength.

3. Neither the roofing company which owned the Sanger patent, nor any other company, presumably, had found it practical or advantageous to adopt commercially the process of that patent, which disclosed adding anhydrous silica to an asbestos-cement mixture and using steam in curing, although that process had been known since 1917.

4. The process disclosed by Schumacher showed, on test, that with a sand-cement mixture the greatest strength was obtained with pressure steam curing when the ratio of admixed fine silica to cement was about 0.25 parts of silica to 1 part of cement (App. 36), but the increase in strength was small.

5. The industry had never seen fit to adopt the Schumacher process commercially, either before or after the patent expired in 1928, even though in laboratory tests a sand-cement mixture having added fine silica and cured with steam under pressure gives an added strength, and that procedure had been known since 1911.

6. Using 5 parts of silica to 80 parts of cement and 15 parts of asbestos, as proposed by Sanger, and normally curing, as disclosed by Sanger, gives some decrease in strength, and if cured with steam under pressure a lesser strength would result than that obtained by normal curing.

7. The drop in strength resulting from curing an asbestos-cement product with steam under pressure is far greater than any gain in strength which can be obtained by adding fine silica to a sand-cement mixture and curing with steam under pressure.

8. As curing an asbestos-cement mixture with steam under pressure decreases the strength about 65 per cent, and curing a sand-cement mixture plus the most effective amount of admixed fine silica (ratio 0.25 to 1) with steam under pressure increases the strength about 9 per cent, it would be reasonable to suppose that curing an asbestos-cement-fine silica mixture with steam under pressure would give a drop in strength of possibly about 56 per cent (65 per cent minus 9 per cent).

9. Trying out the combined ideas of Schumacher and Sanger by using 0.25 parts of silica to 1 part of cement (which works best in Schumacher) in an asbestos-cement mixture, and normally curing as in Sanger, gives reduced strength, and when curing with steam under pressure, as in Schumacher, gives a strength less than that obtained by normal curing without admixed silica.

The Invention Here in Issue.

As previously noted, a typical asbestos-cement mixture normally cured may have a breaking strength up to 3820 pounds per square inch in a testing machine. By the present invention the inventors have taught:

1. How a strength up to 4865 pounds per square inch may be obtained, which is an increase of over 28 per cent.

2. How pipes of asbestos and cement can be made, which will stand an internal pressure of 800 pounds per square inch, and which have a glossy smooth surface, facilitating flow of liquids therethrough, and which is not affected by the usual corrosive liquids within or outside of the pipe.

3. How roofing and siding shingles may be made of asbestos and cement, and which are thinner and lighter in weight, have substantially less expansion and contraction under varying atmospheric conditions, and will not curl or warp appreciably, and of sizes never previously commercially possible.

4. How thin, flexible boards may be made of asbestos and cement, and which are suitable for the walls of bathrooms, kitchens, and the like.

5. How the cost of manufacture, shipment, storage and handling can be substantially reduced, and the time of manufacturing reduced to a small fraction of that previously required.

By reason of these and other advantages, they have revolutionized the industry and built up a business which amounted in sales of asbestos-cement products to less than $700,000.00 in 1934, before adopting the invention, jumped to over $8,000,000.00 in 1940, and was estimated at the time of the trial on November 12, 1941, to exceed $15,000,000.00 for the year 1941. (Ex. 13, App. 79)

This has been accomplished by doing three things, any one of which alone would ruin the product.

1. They cured with steam under pressure, which alone reduces the strength of an asbestos-cement product.

2. They added fine silica, which alone reduces the strength of an asbestos-cement product.

3. They increased the amount of silica in respect to the cement to a point far above that suggested by Sanger for asbestos-cement products (.065 to 1), and above that which gives the best results in the Schumacher process (0.25 to 1) for sand and cement, even though with normal curing, the more fine silica added to an asbestos-cement mixture, the weaker the product.

A typical claim for the new composition is No. 16 (App. 70):

> "A composition of matter adapted for use in the form of building slabs, sheets, shingles, pipes, and the like, said composition being characterized by its relative high structural strength and resistance to corrosion and being composed essentially of the reaction product of partially setting in the absence of steam under pressure and then substantially completely curing in the presence of steam under pressure an intimate mixture including asbestos fibres, water, Portland cement and silica, said cement and silica being present in the mixture in finely divided form and in the proportions of 100 parts of cement to 30 to 90 parts by weight of silica."

A typical claim for the method is No. 20 (App. 71):

> "In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture accompanied with the application of pressure, then allowing the shaped mixture to take an initial set and partial cure, and subjecting the initially set material to steam under superatmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement."

COMMERCIAL USES AND ADVANTAGES OF THE PRESENT INVENTION.

The Patent Office Solicitor at the trial said (App. 28):

> "the Patent Office has not questioned the utility of this product, nor its commercial success."

Nevertheless, the utility and success under the invention have been so phenomenal that it seems advisable to comment briefly on certain facts brought out at the trial.

The principal asbestos-cement products manufactured by Johns-Manville Corporation, one of the parties to this suit and the assignee of the invention, are roofing and siding shingles, pipes, and flat and corrugated sheets. The pipe is known in the trade as Transite pipe, and is used for conducting sewage and water under pressure, and as a flue pipe or a vent pipe. It is also used as a conduit for enclosing and protecting electric cables. (App. 26.)

The Transite pipe is sold in competition with pipes made of cast iron, protected steel, galvanized iron and reinforced concrete. Its very great advantage as against cast iron is its high resistance to corrosion from the liquids conducted, and from acids and alkalies in the soil in which it is used. Its great advantage over reinforced concrete is its smooth surface, which greatly facilitates the flow of the liquids, such as sewage or water, and its high strength, which permits water to be conducted under high pressure. Each piece of pipe which is to stand 200 pounds of pressure per square inch is tested at the factory to 800 pounds per square inch. (App. 27.)

Its resistance to crushing is also important, as the pipes are made in 10 to 13 foot lengths, and from 2 to 36 inches in diameter, and the pipe must resist the weight of the rock and soil that is piled into the trench after the pipe is laid, as well as the unequal pressure due to the fact that the pipe as laid may be supported only at its ends, and its middle portion must support the earth filled into the trench on top of the pipe (App. 27, 28).

The corrosion resistance is also important where the pipe is used as a conduit for electric cable, because there is far less corrosion of the lead sheathing of the cables (App. 44).

A sample of the Transite pipe and booklet regarding it are in evidence as Exhibits 3 and 4.

The great advantage of the present invention so far as concerns roofing and siding shingles is that the expansion and contraction due to moisture absorption are reduced by about 75 per cent, so that the shingles do not open up at the joints, and there is less warping or curling. There is also less breakage in shipment and handling because of the greater strength. The longer the shingles the fewer fasteners are required and the fewer joints are exposed. Some shingles such as Exhibit 7 are now made 30 inches long, and they are only about ⅛ inch in thickness (App. 30, 31). A shingle of this proportion made of either asbestos and cement, or sand and cement, would be entirely impractical without the present invention. (App. 30) Booklets regarding the shingles and siding are in evidence as Exhibits 5 and 6.

A further product is corrugated board, (Ex. 8 and booklet, Ex. 9) which is used principally for industrial roofing and siding, and is highly important because of its resistance to corrosion from factory fumes, and because of its great strength, as pointed out in the booklet.

Another type of product using the present invention is known as Flexboard, and is used for wainscoating and for wall panels in bathrooms, kitchens, restaurants and similar places. These are made in 8 feet lengths of only ⅛ inch in thickness and are slightly flexible. Such boards would not be practical without the present invention (App. 32). Samples are in evidence as Exhibits 10A, B and C, and the booklet regarding it is Exhibit 11.

EXTENT OF COMMERCIAL ACCEPTANCE OF THE INVENTION.

The commercial success of the invention is phenomenal. Johns-Manville Corporation was making asbestos-cement products many years prior to the adoption of the present invention in 1935 (App. 31 and 40). The chart (Ex. 13, App. 79) shows graphically the increase in total sales of asbestos-cement products from 1931 to 1941, as follows:

Before the invention

1931	$381,510	
1932	$283,388	
1933	$343,927	
1934	$646,463	
		$1,655,288

	Using the invention	
1935	$1,589,387	
1936	$4,193,773	
1937	$6,554,177	
1938	$6,274,159	
1939	$6,914,904	
1940	$8,684,567	
1941	$15,635,000	
		$49,845,967

During that period there has been a substantial increase in the total sales of all products by Johns-Manville Corporation, but the volume of the sales of products made under the present invention has increased out of all proportion to the general increase in business. As shown on the chart (Ex. 12, App. 78), the asbestos-cement products constituted only about 1 per cent of the total business of the company in 1931, and has increased to about 18 per cent of the total business in 1941. The proportional increase in business is clearly shown on the chart (Ex. 14, App. 80). With the year 1931 taken as a base, the sales in the asbestos-cement products made little progress until the adoption of the present invention in 1935, and then there began a rapid increase. In 1941 the total business of the company had increased to 2.7 times its 1931 business, whereas the special asbestos-cement products of the present invention in 1941 had increased to 41 times that of the 1931 business.

These charts, and the facts regarding them, were explained in some detail by Mr. Baldwin, a Vice-President of the Johns-Manville Sales Corporation (See App. 40, 41, 42). He pointed out (App. 43) that the increase had been due to the superior characteristics of the products, such as increased chemical resistance, lessened expansion and contraction due to moisture, and greater strength, and that as the products were lighter, the freight and cost of transportation was less and the expense of manufacture was reduced (App. 43, 44). The increase in sales has not been due to any strenuous advertising effort, as the advertising of these products has been only in about the same proportion as that of other products of the company (App. 43-45).

STATEMENT OF POINTS.

The only point involved in this case is as to whether or not the Patent Office and the District Court erred in holding that Appellants did not exercise inventive ability in producing their new and meritorious process and patent, in view of the disclosures of the patents to Sanger and Schumacher and the proofs in regard thereto.

SUMMARY OF ARGUMENT.

1. The basic and novel conception of Appellants' invention was in finding out how new and advantageous results, never obtained by any prior process, could be obtained by employing *three* factors which, if used individually, produce disadvantageous and undesirable results.

> A. Pressure steam curing reduces the strength of an asbestos-cement mixture, and was therefore something to be avoided. Appellants went directly contrary to accepted knowledge and theory when they employed that factor to obtain increased strength in such a product.
>
> B. Adding fine silica in any amount in the standard process of making asbestos-cement products decreases the strength, and was therefore something to be avoided. Appellants went directly contrary to accepted knowledge and theory when they employed that factor to obtain increased strength in such a product.
>
> C. The more finely divided silica added in a standard process of making asbestos-cement products, the lower is the strength. Appellants went directly contrary to accepted knowledge and theory when they employed a higher ratio than had ever been suggested, to obtain increased strength in such a product.

2. When results never before achieved are achieved by going directly contrary to the teachings of prior experience

and knowledge, it evidences ingenuity and inventive ability of a higher order.

3. The proportions of fine silica to cement defined by the lower and upper limits (30 to 100 and 90 to 100) are *critical* under standard dictionary definitions, and under rulings of this Court. Each limit defines the point where a certain result is reached. Each limit defines where a change or transition takes place. Any substantial departure from limits specified in the claims results in failure to achieve a strength beyond that known in the prior art for asbestos-cement products.

4. The statements in the Sanger and Schumacher patents cannot be taken at their face value, as both patents are false and misleading in their teachings. Both Schumacher and Sanger were citizens of Germany, and false and misleading teachings are not an uncommon characteristic of patents of citizens of that country, as the courts have had frequent occasion to note.

5. Sanger, when he applied for his patent, was obviously familiar with the teachings of the Schumacher patent, but it was not obvious to him how he could have obtained a better product by following any of such teachings.

6. Appellants' process could not have been obvious to skilled workers in the art, because the market demand existed, as proved by Appellants' sales, and in spite of, or because of, the teachings of Sanger and Schumacher, no manufacturer found out how to make a product to meet the demand.

7. Building up of an applicant's process by the hindsight afforded by knowledge of the applicant's disclosure, has been repeatedly condemned by this and other Courts.

8. In the present case, invention is evidenced by

a) complete satisfying of a long felt want;

b) the benefits conferred upon various branches of the industry;

c) providing the industry with products which could not have been made by any prior known process and of far greater effectiveness and practical value than any previously available, and

d) the rapidly accelerating rate at which the industry has acquired and is acquiring and using such products in preference to others of cement and asbestos, or of any other materials such as cast iron, galvanized sheets, reinforced concrete, etc.

ARGUMENT.

As is the case in most appeals coming to this Court under R. S. 4915, and involving the question of patentability, the Examiner, the Board of Appeals and the District Court have concurred in their refusal to find the claims in question to be patentable.

We are not unmindful of the fact that in such cases there is a heavy burden on the appellant, and we are aware that this Court in recent decisions has ruled that the Findings of the District Court in cases under R. S. 4915 must be accepted unless clearly erroneous, and has stated in *Abbott* v. *Coe,* 71 App. D. C. 195, 197; 109 F. 2d 449, 451:

> "The question for us is not whether in our opinion there was invention, but whether the finding that there was none is consistent with the evidence."

In the present case we submit that the record is clear that the Findings are "clearly erroneous" and are not "consistent with the evidence."

The facts hereinbefore set forth are clearly established, and are not in any way challenged by the Patent Office. There is no contention that the subject matter of the claims here involved is disclosed in either of the two patents relied upon by the Patent Office and by the District Court. There is no denial of the fact that the patents relied upon are mere paper patents, inasmuch as the processes disclosed have been of no benefit to the industry, and have never been adopted or commercially used.

There is no denial that:

1. Using Sanger's ratio of cement, asbestos and silica and curing with steam at atmospheric pressure gives a small decrease in strength.

2. Modifying the teaching of Sanger, and curing with steam under pressure as taught by Schumacher, gives a very large drop in strength.

3. Using Schumacher's mixture as a binding material for asbestos fiber with normal curing causes decrease in strength, and curing with steam under pressure also causes decrease in strength.

4. Using Schumacher's formula, in its most effective proportions but replacing the sand with asbestos and either normally curing or curing with steam under pressure, does not give as high strength as the prior and well known normal curing of a standard asbestos-cement mixture.

Therefore it is clear that neither patent alone, and neither patent interpreted in the light of the other, would give anything except failure when endeavoring to get increased strength of a product made of asbestos and cement.

There is no question as to the important commercial advantages achieved by the use of the present invention, or as to the enormous commercial success and wide public acceptance of the products because of their new, important and valuable characteristics and properties.

In *Davies* v. *Coe*, 65 App. D. C. 345, 83 F. 2d 602, this Court said:

> "Evidence of great utility may in some circumstances be accepted as evidence of invention. Wach v. Coe, 64 App. D. C. 235, 77 F. (2d) 113. * * * It is a far cry from the Bligh theoretical and impractical shaving device, consisting of a rapidly revolving abrasive roller, to appellant's abrasive, which has been demonstrated to be practical and useful in removing superfluous hair."

The present invention could not have been obvious to those skilled in the art from an examination of the two prior patents, because it would be unreasonable to assume that any company interested in the manufacture of asbestos-cement products would have foregone the opportunity of greatly improving its products and increasing its sales by adopting Appellants' process as far back as 1928, when the Schumacher patent expired. Asbestos Slate Roofing Manufacturing Company, Inc., which owned the Sanger patent certainly would have manufactured its shingles by the Sanger process if that process had been practicable, or would have modified the process of its Sanger patent in the light of the Schumacher patent which had expired, and with which it was familiar, if its experts had known how to make such modification as would have resulted in a practicable or salable product.

Appellants' process is not disclosed in the Schumacher patent, as:

1—Appellants' claims are limited to asbestos-cement, and this is vital to the process. Schumacher does not disclose or in any way refer to the use of asbestos.

2—Appellants' process requires the proportion of cement to be in excess of the proportion of asbestos, as is emphasized for instance in claim 14 (App. 3), and Schumacher uses a mixture of 2 parts of sand to 1 part of cement (App. 83, lines 13-15), which is a proportion not in any way applicable to asbestos-cement products. (App. 24.)

3—Appellants' claims are all limited to the use of 30 to 90 parts of fine silica to 100 parts of cement, and this is vital to the process. Schumacher does not state the amount of silica (quartz powder) but states:

> "The most favorable addition of silica for each kind of cement can easily be found by way of experiment." (App. 83, lines 35-38.)

Experiment shows that the amount of silica to be added to give the greatest strength with the Schumacher mixture of 2 parts sand to 1 part of a typical cement should be about 25 parts of added silica for 100 parts of cement, which is below and outside of the range of Appellants' claims.

Appellants' process is not disclosed in the Sanger patent, as:

1—Appellants' claims are limited to curing with steam under pressure, and that is vital to the process. Sanger does not teach that method of curing. If one follows the teaching of Sanger and cures a mixture of asbestos, cement and anhydrous silica merely with steam as he teaches, the strength of the resulting product is lower than would have been obtained had the silica been omitted.

2—As curing Sanger's mixture with steam under pressure would have given a much lower strength, and as Sanger did not refer to any reduced time for curing, such as is effected by steam under pressure, and as curing under pressure was not then a commercially used procedure, it must be assumed that Sanger necessarily had in mind, and the art would understand, that the use of steam was not essential to his process, and if used, was to moisten the atmosphere and create a fog for normal curing.

3—Appellants' claims are limited to the use of finely divided silica and that is vital to the process. Sanger does not teach the use of silica in any particular state of subdivision, and his term "anhydrous silica" does not distinguish from sand. He refers to "quartz powder" (App. 85, line 26), but only in discussing what was previously known (presumably from the Schumacher patent). He carefully avoids using the terms "quartz powder" or "finely divided silica" in the description of his process.

4—Appellants' claims are limited to the use of 30 to 90 parts of finely divided silica to 100 parts of cement, and this is vital to the process. Sanger's ratio of silica (regardless of its state of subdivision) to cement is 5 to 80, which is about 6½ to 100. This is far below the ratio employed in the present invention and below that necessary to secure any increase in strength or any of Appellants' advantages.

Neither Patent Discloses How Appellants' Many Advantages Can be Obtained.

Although both Schumacher and Sanger claim to obtain increased strength by means of their respective processes, the maximum increase of 9 per cent in strength which Schumacher can get in his sand-cement process would be of relatively little value in an asbestos-cement product, and Sanger's process is a step backward in the art, because in spite of his contentions, he gets a decrease regardless of how the curing is effected.

Neither of the patents in any way discloses any process whereby Appellants' many other important advantages can be obtained. They do not teach any process which may be employed to make roofing or siding shingles which will not warp or curl appreciably on exposure to atmospheric conditions in use, or how shingles or siding can be made which will have less expansion, contraction and opening up of joints on exposure to the moisture of the air. Preventing expansion and contraction under changing atmospheric conditions is important, not only in shingles, but in such products as Appellants' Flexboard, which is used as a wall covering in kitchens or bathrooms, where the air at times is dry and at other times supersaturated with moisture.

The patents do not disclose how products of any kind can be made which will be resistant to corrosion from acids, alkalies, and such reactants as may be present in the atmosphere around factories, or in the soil around pipes, or in fluids conducted by pipes.

If the strength factor be entirely ignored, these important advantages, which are not in any way taught by Schumacher or Sanger, and which would not result from the use of their processes, and which are obtained by Appellants' invention, are sufficient to indicate that genius of a high order was required in ascertaining how to attain them.

The position of the Patent Office, and of the District Court, as reflected in its Finding of Fact, is that although neither Schumacher nor Sanger discloses Appellants' invention, the invention could be built up by picking steam pressure curing from Schumacher, and applying it to the Sanger process, thereby getting a product which was worthless, and then starting a series of experiments and tests, and eventually finding how failure could be converted to success.

This Court, in *Hartford-Empire Co.* v. *Coe,* 66 App. D. C. 344, 87 F. (2d) 741, 744, said:

> "We have had occasion in many instances to condemn the hindsight nunc pro tunc method employed to justify the refusal of valuable inventions in which the patentees are entitled to the protection afforded by the Constitution and the laws."

The Schumacher and Sanger Patents Are Mere Paper Patents Which Are False and Misleading in Their Teachings.

There is no evidence of any commercial use of either the Schumacher or the Sanger process. Witnesses, who have had years of experience in this art, had never known of any product being made under either patent. Both patents are false and misleading in their teachings; Sanger, because it teaches that an asbestos-cement product may be given increased strength by using 5 parts of anhydrous silica for 80 parts of cement, and Schumacher because it teaches that the amount of fine silica to be added to a sand-cement mixture should be such as will bring the total silica, including that already in the cement, up to the amount of the lime.

Schumacher was a citizen and resident of Germany, and Sanger, although a resident of New Jersey, was also a citizen of Germany. Citizens of that country, in their patents, are prone to lead the art away from rather than toward success.

In *United States* v. *Chemical Foundation, Inc.*, 5 F. (2d) 191, the Court of Appeals, Third Circuit, had before it a large number of United States patents granted to citizens of Germany and which had been seized by the Alien Property Custodian. In that case the Court, in an opinion by Judge Woolley, said:

> "Moreover, some of the patents are product patents, that is, patents for products with nothing to show how to make them. More serious still,—such a sale being limited to American citizens,—the evidence discloses that American citizens had at that time very little of the 'know how,' and hence the process patents meant less to them than to the Germans. Here is the abnormal problem. Then again, German patents have not always enjoyed the best reputation. Alpha Portland Cement Co. v. Schratweiser, 221 F. 258, 259, 137 C. C. A. 111; Rohm et al. v. Martin Dennis Co. (C. C. A.) 263 F. 388; Seward's Science and the Nation, p. 18, the disposition of German applicants for patents being to make meager and sometimes insufficient disclosures. For example, Dr. Holdermann, who was a member of the German firm which before their seizure owned the Haber nitrogen-fixation patents and who came from Germany to attend the trial of this case, testified that these process patents (fifty-eight in number) are worth $17,000,000, yet the learned trial judge found on evidence which we think abundantly sustains him that, because their disclosures are of doubtful adequacy even to Germans other than those specially trained under the patents, and because their disclosures are wholly inadequate to workers in the chemical art in America, these patents are without substantial affirmative value to American citizens." (p. 212)

In *R. H. Comey* v. *Monte Christi Corp. et al.*, 17 F. (2d) 910, the Court had before it a process patent of a German citizen which had been tested by experts of both the Plaintiff and the Defendant. The Court said that:

> "the action of these two chemists, both of unquestioned integrity, of high standing in their science, and highly skilled in the art, shows that the patent did not tell them how to produce the product or its results." (p. 912)

Another patent of a German citizen was before the Court in *General Chemical Co.* v. *Selden Co.*, 67 F. (2d) 133. In that case the Court said:

> "it may well be that the alleged success of this patent in Germany may be due to some feature which was not disclosed in the application. At any rate, we are clear that the court below correctly held that this patent, instead of promoting the art, was a mere paper one whose function was words, not work."

The Decision of the Board of Appeal (App. 73-75) Ignores the Essential Features of the Invention.

In regard to Sanger, the Board of Appeals said (App. 74):

> "We recognize that the percentage of silica in Sanger is relatively small when compared with the amount employed by appellant and perhaps the disclosure of this patent is not of any great importance * * *".

As to the present invention, the Board of Appeals assumed that what Appellants considered as their contribution

> "is the particular proportion of silica to cement, namely 30 to 90 parts of silica to 100 parts of Portland cement" (App. 74),

but the Board entirely ignored the fact that Appellants' invention does not involve that proportion *except* in asbestos-cement mixtures. It is the wrong proportion to use to obtain useful results in a sand-cement mixture.

The Board ignored the fact that the invention involves that specified proportion of silica to cement *only* in a cement-

asbestos mixture, *plus* the curing of such a mixture of asbestos, cement and fine silica with *steam under pressure.*

After stating that the Sanger patent "is not of any great importance" so far as concerns the proportion of silica to cement, the Board noted that the proportion disclosed in the Schumacher patent is likewise different from that claimed by the Appellants (App. 75), and then stated:

> "It is our opinion, however, that the disclosure of Schumacher on this point is not particularly important." (App. 75.)

In stating that

> "This patent (Schumacher) clearly teaches the advantage of mixing finely divided silica with cement when steam curing is to be employed * * *" (App. 75),

the Board completely ignored the fact that what Schumacher purports to teach is the amount of fine silica to be added to a *sand*-cement mixture, and also ignored the fact that either adding silica to an asbestos-cement mixture, or pressure steam curing of an asbestos-cement mixture, ruins the product for practical purposes.

In effect, the sole ground of rejection by the Board of Appeals was stated as follows:

> "it is thought that no invention was exercised in experimenting with a silica cement composition * * * and determining about what proportion of silica would produce the strongest product." (App. 75.)

Here again the Board ignored the fact that the invention is limited to pressure steam curing and to asbestos-cement products. Even if those conditions are to be understood, the statement is clearly untenable and would have been tenable *only if* the prior art had taught:

1) that steam curing of an asbestos cement mixture increased the strength, or

2) that adding of fine silica to an asbestos-cement mixture increased the strength, or

3) that the prior art taught that some increased strength could be obtained by pressure steam curing a mixture of asbestos, cement and fine silica.

The facts are that the prior art does not and cannot teach the first two of these which are not true, and nowhere in the prior art is there any disclosure justifying the third.

Although the Board, in its opinion, quoted claim 13 (App. 73-74), the only claim which it specifically referred to was claim 5 (App. 75) and it seems to have judged the invention primarily as defined in that claim (App. 69), which did *not* define Appellants' real invention because unfortunately it did not include asbestos as an essential ingredient of the composition or method. That claim is not involved in the present suit (App. 7 and 87), and was not before the District Court.

THE FINDINGS OF FACTS OF THE DISTRICT COURT.

The case was argued at the close of the trial (App. 46). No briefs were desired by the Court, and no Opinion was filed.

Certain of the Findings are "clearly erroneous" and are not "consistent with the evidence".

1—Finding of Fact No. 5 states:

> "* * * Schumacher teaches the addition of about 44 parts of finely divided silica to 100 parts of Portland cement". (App. 88.)

This figure "44" is not in the Schumacher patent and is obtained only by interpreting Schumacher's statement, quoted in Finding of Fact No. 5, in the light of the cement analysis given in Appellants' application (App. 49). This Finding ignores the fact that the testimony before the Court proved that Schumacher was in error, and that a typical Portland cement, such as is disclosed in Appellants' application, mixed with sand in the proportions stated in the Schumacher patent, gives the greatest strength when 25 parts of finely divided silica are added, and not the 44 parts referred to in the Finding.

2—Finding of Fact No. 6 states that:

> "The articles (of the Sanger patent) are made of a composition consisting of asbestos fibre, cement and finely divided silica."

As has been previously pointed out, there is no teaching in the Sanger patent as to the extent of division of the silica, and the testimony establishes that coarse silica, such as sand, is in no sense the equivalent of fine silica in Appellants' process or product.

3—The last sentence of Finding of Fact No. 4 is as follows:

> "There is nothing critical in the proportion set forth in the claims at bar, namely 30 to 90 parts of added silica to 100 parts of cement."

This is clearly erroneous and not consistent with the evidence. Funk & Wagnall's New Standard Dictionary, in defining the word "critical" states that a "critical current" is that "at which a certain result is reached" and that a "critical temperature" is

> "A temperature which is characterized by a change or transition".

What is meant by "critical" is also clear from the opinion of this Court in *Becket* v. *Coe,* 69 App. D. C. 51, 98 F. 2d 332, where the Court had before it a composition of matter in the form of an alloy in which the novelty resided in the percentages of certain of the ingredients employed, and the advantages attained were due to the use of those ingredients in the proportions specified. In reversing the concurrent decisions of the District Court and the Patent Office the Court said:

> "Patentability of an alloy upon the basis of new proportions of old elements requires that the new pro-

> portions give a new result; either a new alloy, or an old alloy with new characteristics which result in entirely new, or *substantially enhanced, qualities of utility.*
>
> * * * * *
>
> "There is evidence that *the proportions named by Becket are critical;* in other words, that substantial departure from his proportions will result in failure to achieve the alloy of his invention." * (69 App. D. C. 51, 55.)

In the present case the proportions are "critical" as they are those within which a "certain result" is reached, namely a strength greater than can be obtained by prior art normal curing. They are "critical" because a "change or transition" takes place when the ratio of 30 parts of finely divided silica to 100 parts of cement is reached, because beyond that point the strength becomes greater rather than lower than that obtained by normal curing, with or without added fine silica, and another "change or transition" takes place when the ratio of 90 parts of finely divided silica to 100 parts of cement is reached, because beyond that point the strength again becomes lower than obtained when normal curing is used without added silica. As in the *Becket* case, any "substantial departure" from Appellants' "proportion will result in failure to achieve" the product of their invention. This will be apparent from Fig. 2 of the application drawing (App. 57). That shows that in the particular tests referred to in the application, the strength was 3500 pounds per sq. in. when the ratio of silica to cement was 0.3 to 1 (30 to 100), and was again 3500 pounds per sq. in. when the ratio was 0.9 to 1 (90 to 100). It was lower than 3500 when the ratio was below 0.3 to 1 and also when it was above 0.9 to 1. It was higher than 3500 when the ratio was between 0.3 and 0.9 of silica to 1 of cement.

If one used in Appellants' process the ratio of fine silica to cement which gives the maximum strength in Schumacher's process, namely 0.25 to 1, a strength of less than 3500, namely about 3200, would be obtained, and if one used Sanger's proportions, namely 0.065 to 1, in Appellants' process, the strength would be only about 1600, as appears from the curve of Fig. 2 (App. 57).

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* Italics ours.

The proportions discovered by the Appellants and set forth in the claims here in issue are critical only when one uses asbestos and cement, and only when one cures with steam under pressure, both of which factors are called for in the appealed claims. The new results are not only the securing of an asbestos-cement product of greater strength than the prior art knew how to obtain, but also the securing of one which has 75 per cent less expansion and contraction when exposed to the atmosphere, has a negligible tendency to warp or curl when exposed in thin plates such as shingles, and is not corroded by the acids, alkalies and fumes to which the product may be exposed.

5—Findings of Fact Nos. 7, 8 and 9 (App. 89) hold that there was no invention in modifying the disclosure of the Schumacher patent in view of Sanger, or in changing Sanger's proportions in view of the teachings of Schumacher.

This Court is Not Bound by the Findings of the District Court.

As noted in *Abbott* v. *Coe*, 71 App. D. C. 195, such findings are not binding on this Court. The Court of Appeals, Ninth Circuit, in *Wire Tie Mach. Co. et al.* v. *Pacific Box Corporation, Limited, et al.*, 102 F. (2d) 543, said:

> "The court below found as a fact that the claims of the Parker patents in suit did not constitute invention. As a general rule this court will not overturn the findings of fact of the trial judge, since he has had an opportunity of hearing the witnesses testify and is in a better position than this court to judge their veracity. However, in a case such as the case at bar, the question of whether or not the subject matter constitutes invention

> does not turn upon the truth or falsity of the testimony of the witnesses. Their testimony of necessity is as to their opinions of whether it required more than mechanical skill to effect the combination of parts." (p. 552)

In the present case there is no question as to the truth or falsity of the testimony of the witnesses, and their statements have not been in any way challenged.

The question of invention is essentially one of opinion, based upon the established and uncontroverted facts, and the law.

According to Funk & Wagnall's New Standard Dictionary an opinion is

> "the formal announcement of the conclusions of a court in a case before it."

and a "conclusion" is

> "a proposition the truth of which is inferred from a premise or premises."

This Court in *O'Connell* v. *Schmidt*, 27 App. D. C. 77, after stating that except in extraordinary cases the findings of fact of the Patent Office will not be disturbed, said:

> "This however does not mean that we are bound by the conclusions drawn from such facts unless we are convinced that such conclusions are correct. The lower tribunals may agree that certain facts do not prove a reduction to practice or due diligence. This tribunal, while accepting the facts, may be convinced that the conclusion is erroneous and therefore for that reason, be compelled to reverse the judgment appealed from."

In *Woods* v. *Poor*, 29 App. D. C. 397, this Court said:

> "And, where the facts are admitted, and a mere question of law is involved, the court will not hesitate to reverse the judgment appealed from if convinced that an erroneous conclusion was reached."

In *College Entrance Book Co., Inc.* v. *Amsco Book Co., Inc.,* (C. C. A. 2) 119 F. (2d) 874, the Court said:

> "Since the evidence itself was uncontradictable, the inferences drawn from it by the court below cannot be sustained."

In the present case the evidence was uncontradictable, and the question of whether or not invention was involved, in view of such facts, has been decided by the Patent Office and the District Court in a manner which conflicts with the rulings of this Court in many cases including:

Wach v. *Coe,* 64 App. D. C. 235.
Becket v. *Coe,* 69 App. D. C. 51.
Poulsen v. *Coe,* 73 App. D. C. 324.

APPELLANTS PRODUCED A REAL INVENTION.

As noted by this Court in *Poulsen* v. *Coe,* 73 App. D. C. 324, 119 F. 2d 188, the quality of inventiveness must be tested by reconstituting the situation as it was in the light of the preceding history of the art. As so tested, such Findings are clearly erroneous for the reasons hereinbefore stated.

What might one skilled in the art do if he were desirous of producing an asbestos-cement product of greater strength, and less warping, expansion and contraction when exposed to the weather, and had before him both the Schumacher and Sanger patents?

He would probably make inquiry and find that each was a mere conception which never developed to factory birth or sales maturity. He would first try out Sanger because it relates to asbestos-cement products and claims the obtaining of greater strength. He would fail to get the increase Sanger claims and would get a reduction of 50 per cent or more in strength. He might try out various proportions of "anhydrous silica" cement and asbestos and would find that the more anhydrous silica he added, the weaker would be the product. He would probably stop there and look no further. Dr. Rembert testified (App. 25):

> "Had we known of it (Sanger patent) and accepted the results obtained by trying his example, we would have been discouraged, and probably would not have continued our work."

But let us suppose the investigator were not so easily discouraged and had ignored the established differences obtained in steam curing sand-cement and asbestos-cement products. He would note that the Schumacher patent (which has nothing to do with asbestos-cement products) says to cure with steam under pressure and therefore he would again try out the Sanger process, but this time use Schumacher's curing process. The result would again be lower strength than the standard obtained in the industry with cement-asbestos, with no added fine silica.

Where would he go from there?

As this Court said in *Poulsen* v. *Coe,* 73 App. D. C. 324, 335; 119 F. 2d 188, 199:

> "We think it took that boldness, clarity of vision and ingenuity characteristic of invention, as distinguished from mechanical skill, to attempt the voyage upon which the appellants set out and to sail it successfully so that at the end"

the loss of strength resulting from using fine silica in asbestos-cement mixtures and the loss of strength resulting from pressure steam curing of asbestos-cement mixtures were avoided, and a highly valuable and commercially successful process was discovered, to the great benefit of all users of asbestos-cement products. The Court noted that in *Wach* v. *Coe,* 64 App. D. C. 237, 77 F. (2d) 113, "the problem was apparently unsolvable" to experts in the field.

APPELLANTS WENT CONTRARY TO THE TEACHINGS OF THE ART.

Not only was the present problem apparently unsolvable, but the solution contradicted the teachings of the prior art. Sanger, the only reference relied upon which discloses an asbestos-cement product and process, taught the art *not* to use Schumacher's ratio of silica to cement, and *not* to use Schumacher's pressure steam curing. On the contrary it falsely taught one to use a much lower ratio of silica to cement, and to use ordinary curing with steam to moisten the atmosphere. These teachings lead one to failure and not to success, and Appellants succeeded only by going directly contrary to them.

In *The Mathieson Alkali Works* v. *Coe,* 69 App. D. C. 210; 99 F. 2d 443, this Court, in holding that the discovery made by the applicants constituted invention, said:

> "Their process was not taught by the prior art; in fact *it contradicted the teachings of the prior art,* and in so doing produced a new and useful result. It met a long standing need of the industry—a practical method of bleaching cellulosic material without deteriorating the material itself; and it constituted a marked advance in the art." (Italics ours.)

In *Davies* v. *Coe,* 65 App. D. C. 345; 83 F. 2d 603, this Court said:

> "Appellant's method differs radically from Bligh. In fact, in the light of appellant's successful disclosure, it may be said that Bligh has *taught the art what not to do instead of what to do.*" (Italics ours.)

As stated by Judge Learned Hand in *Kirsch Mfg. Co.* v. *Gould Mersereau Co., Inc.,* 6 F. (2d) 793:

> "An invention is a new display of ingenuity beyond the compass of the routineer, * * * the question must be resolved by a subjective opinion to what seems an easy step and what does not." (p. 794)

No routineer or one skilled in the art would consider for a moment taking three steps, each of which alone would ruin the product (*ante,* p. 14), with the expectation of securing a vastly superior product. It would be just as logical for a baker to use moldy flour and ancient eggs, and bake at a temperature which past experience showed would burn up the product, with the expectation of producing a superior cake.

The three changes which Appellants introduced into the art as it stood under Schumacher and Sanger, were a clearer departure from the prior teachings of the art than were the three steps taken by Poulsen, as set forth by this Court in *Poulsen* v. *Coe, supra.* There, as here,

> "the rejection by the trial court and the Patent Office was demonstrably the result of clear error in respect to the foundation for rejection."

In the *Becket* v. *Coe* case the Court said:

> "It will at once be seen that the specifications set forth in the appellant's claims 9, 10 and 11 fall within the ranges in the Hadfield (French) and Commentry (French) patents." (69 App. D. C. 51, 53; 98 F. 2d 332, 334.)

In the present case the Sanger and Schumacher patents give no ranges, and Appellants' claims define ranges *outside of* and *above* what is specified in Sanger and what works best in Schumacher.

In the *Becket* v. *Coe,* case, the Court stated that the references

> "* * * state ranges which include the Becket discoveries. We think it was still possible, however, for an inventor to investigate subsequently and to find for the first time a chromium-manganese-nickel-copper ferrous alloy which was both stainless and deep-drawing. * * * With the Becket application before us it is possible to look back upon the Hadfield (French) and Commentry (French) patents and to say that they suggested what he found, but such hindsight should not, we think, defeat his application." (69 App. D. C. 51, 54-55; 98 F. 2d 332, 335-336.)

APPELLANTS' INVENTION ENTITLES THEM TO A PATENT.

As stated by the Supreme Court in *Diamond Rubber Co.* v. *Consolidated Rubber Tire Co.,* 220 U. S. 428:

> "Its simplicity should not blind us as to its character. Many things, and the patent law abounds in illustrations, seem obvious after they have been done, and, 'in the light of the accomplished result,' it is often a matter of wonder how they so long 'eluded the search of the discoverer and set at defiance the speculations of inventive genius.' "*

As Stated by this Court in *Carbide & Carbon Chemicals Corp.* v. *Coe,* 69 App. D. C. 372, 377; 102 F. 2d 236, 241:

> "When the substitution has accomplished a result which those skilled in the art had long and vainly sought to effect, the evidence that it involved something beyond the skill of the calling is so persuasive that it generally resolves the inquiry in favor of patentable novelty.' George Frost Co. v. Cohn, 119 F. 505, 507, 508, 2 Cir., 1902. Again, 'Where the method or device satisfies an old and recognized want, invention is to be inferred, rather than the exercise of mechanical skill. For mere skill of the art would normally have been called into action by the generally known want.' Paramount Publix Corp. v. American Tri-Ergon Corp., 294 U. S. 464, 474, 55 S. Ct. 449, 79 L. Ed. 997, 1935. See also United Shoe Machinery Corp. v. E. H. Ferree Co., 64 F. 2d 101, 103, 2 Cir., 1933, where the court said: 'One of the safe tests of patentability is to inquire as to the condition of the art and the call for improvement.'
>
> * * * *
>
> "It is equally well settled that commercial success is strong evidence of utility and patentability. Walker on Patents (6th ed., 1929) § 126. In Yablick v. Protecto Safety Appliance Corp., 21 F. 2d 885, 887, 3 Cir., 1927, it was stated that the fact that a process comes immediately into general use and replaces all other like

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* Quoted by this Court in *Thornton* v. *Coe*, 69 App. D. C. 383, 388; 102 F. (2d) 247, 252.

> processes is persuasive of invention. This was said upon the faith of Minerals Separation, Ltd. v. Hyde, 242 U. S. 261, 270, 37 S. Ct. 82, 61 L. Ed. 286, 1916, where it was held that the fact that a process was 'immediately generally accepted as so great an advance over any process known before that, without puffing, or other business exploitation, it promptly came into extensive use . . . and . . . largely replaced all earlier processes . . . of itself is persuasive evidence of that invention which it is the purpose of the patent laws to reward and protect.'
>
> "The substitution in the instant case accomplished within Low v. McMaster more efficient action and the first practical success in the art in which the substitution was made. Within George Frost Co. v. Cohn, Paramount Publix Corp. v. American Tri-Ergon Corp. and United Shoe Machinery Corp. v. E. H. Ferree Co., doubt, if any there be, that the substitution was obvious must be resolved in favor of Frazier. He succeeded in satisfying, where the prior art had failed, a recognized need of some ten years standing. In respect of utility, the evidence in the instant case is such that the rule of Smith v. Goodyear Dental Vulcanite Co. and Re Harbeck necessarily operates in Frazier's favor. It was amply established that a high degree of utility was reached in his substitution of vinyl resins as a coating for metal food packaging materials. And finally Frazier is entitled to the benefit of the rulings of Yablick v. Protecto Safety Appliance Corp. and Minerals Separation, Ltd. v. Hyde in respect of commercial success. Commercial success to an extraordinary extent was established in the instant case; indeed, was conceded by the Commissioner."

One of the most recent decisions defining what is necessary as an anticipation and stating the purpose and intent of the patent laws is that of the Court of Appeals of the Second Circuit in *Dewey & Almy Chemical Co., et al.*, v. *Mimex Co., Inc.* (124 F. 2d 986), decided Jan. 5, 1942. The Court had before it a situation somewhat similar to that here involved and, Judge Learned Hand, in speaking for the Court, said:

> "No doctrine of the patent law is better established than that a prior patent or other publication to be an anticipation must bear within its four corners adequate directions for the practice of the patent invalidated. If the earlier disclosure offers no more than a starting point for further experiments, if its teaching will sometimes succeed and sometimes fail, if it does not inform the art without more how to practice the new invention, it has not correspondingly enriched the store of common knowledge, and it is not an anticipation. (p. 989.)
>
> * * * * *
>
> "It would indeed be absurd to rank the invention as a great pioneer such as come only at rare intervals and are the work of genius. Indeed, it is precisely those which probably need no patents to call them forth; the stimulus of profit has little or no part in their production. The patent law is aimed at animating a lower order of imagination and skill than that; more, it is true, than the ordinary rub of competition automatically brings out from competent workmen in the art, but not the superlative skills—at least that has been its uniform avowed purpose. Perhaps the system is outworn, but while it stands, it stands clothed with its history like any other statute, and it seems to us that not to recognize so substantial an achievement as this which has resulted in the improved preservation of foods and other perishable goods, would deny recognition where recognition most is helpful. These inventors did not move along a well-marked way; they struck out a new path which led to a goal that men had unsuccessfully tried to reach for many years. To say that for this they needed to look no further afield than the ordinary routineer, one must shut one's eyes to all the significant facts." (pp. 990, 991.)

The purpose of the patent law, as stated by Judge Hand, is that which has been recognized as the proper one for many years. The Court of Appeals, Fourth Circuit, in *Crown Cork & Seal Co.* v. *Aluminum Stopper Co.*, 108 Fed. 845, over 40 years ago (May 7, 1901), said:

> "Painter's invention is not one of those great epoch-marking discoveries like that of printing, or the steam engine, or the electric telegraph, which opened to their

> inventors the portals of the Pantheon of the immortals. For such as these the love of fame and the glory of being benefactors of human kind served alike as motive and reward, but to the patient laborer in workshop and factory the incentive of fame and glory is absent. For them the stimulus of the rewards offered by our patent laws is needed to encourage by the hope of profit that zealous eagerness to improve processes, to remedy defects in machinery, to invent new methods and appliances for saving labor and cheapening production in the numberless articles that are in daily use. It is this stimulus that has made the American mechanic the most alert, observant, and studious of any in the world, and it is the indefinite multiplication of these small inventions and improvements that has wrought an industrial revolution and brought his country to the forefront of the world's commerce. It was the consciousness that in the knapsack of every private soldier there might be the baton of a marshal of France that inspired her soldiers to unparalleled achievements. In our unheroic, industrial age the central processes of a nation's life lie in production and distribution. The protection and hope of profit held out by our patent laws inspires that stimulating energy which leads to experiment, invention, and all the resulting benefits; a refusal of that protection in a proper case will deaden and destroy it." (p. 870)

CONCLUSION.

In view of the facts above stated and for the reasons above given, it is submitted that the findings of the Patent Office and the District Court that no invention was involved, are clearly erroneous and contrary to the evidence, and the Judgment of the District Court should be reversed.

Respectfully submitted,

Clair W. Fairbank,
Virgil C. Kline,
Harry A. Mitman,
Of Counsel for Appellants.

Lee B. Kemon,
Solicitor for Appellants.

New York, N. Y.,
April 3, 1942.

APPENDIX

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IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA.

No. 8185.

ERNEST W. REMBERT ET AL., *Appellants,*

v.

CONWAY P. COE, Commissioner of Patents.

Appeal from the District Court of the United States for the District of Columbia.

APPENDIX TO BRIEF FOR APPELLANTS.

I.

PLEADINGS AND OTHER PAPERS DESIGNATED BY APPELLANTS.

1 *Bill of Complaint for Issuance of a Patent.*

To the Honorable the Justices of the District Court of the United States for the District of Columbia:

The plaintiffs for cause show:

1. That plaintiff, Ernest W. Rembert, is a citizen of the United States and a resident of Plainfield, in the State of New Jersey, that plaintiff, Edward M. Jenkins, is a citizen

of the United States and a resident of Somerville, in the State of New Jersey, and that plaintiff, Johns-Manville Corporation, is a New York corporation, having a place of business at 22 East 40th Street, New York, New York.

2. That the defendant, Conway P. Coe, is the Commissioner of Patents of the United States, a legal resident of the District of Columbia, and is sued in his official capacity.

3. That this is a suit arising under the Patent Laws of the United States and in particular under Section 4915 of the Revised Statutes.

4. That on or prior to April 9, 1935, the plaintiffs Ernest W. Rembert and Edward M. Jenkins were the original, first and joint inventors of certain new and useful improvements in Cementitious Composition and Article and Method of Making the same which had not been
2 known or used by others in this country before their
invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country before their invention or discovery thereof, or more than two years prior to the date of their hereinafter identified application for Letters Patent therefor, and not in public use or on sale in this country for more than two years prior to the filing of said application, and that the invention had not been abandoned by the plaintiffs, Ernest W. Rembert and Edward M. Jenkins, nor patented in any country foreign to the United States on an application filed by plaintiffs Ernest W. Rembert and Edward M. Jenkins, or either of them, or their legal representatives or assigns more than twelve months prior to the filing of said application for United States Letters Patent.

5. That on the ninth day of April, 1935, the plaintiffs, Ernest W. Rembert and Edward M. Jenkins, made application in writing to the defendant, the Commissioner of Patents, for the grant of Letters Patent of the United States for improvements in Cementitious Composition and Article and Method of Making the Same, duly paid the fee required by law, and in all respects complied with the pro-

visions and requirements of the Statutes and Rules in such case made and provided. That said Ernest W. Rembert and Edward M. Jenkins, by an instrument in writing, duly assigned and transferred to plaintiff, Johns-Manville Corporation, their entire right, title and interest in and to said application, profert of said instrument being hereby made. Said application was known as application Serial No. 15,362 for Cementitious Composition and Article and Method of Making the Same, filed April 9, 1935, all of which will fully appear from the certified copy of said application, profert of which is hereby made.

6. That on or about June 11, 1938, the Primary Examiner, acting for and on behalf of the defendant, finally rejected certain claims of said application, to wit, claims 13, 14 and 16, as follows:—

3 13. In making a strong cementitious composition, the method which includes forming a flowable mixture comprising water, asbestos fibres, Portland cement, and admixed finely divided silica, said cement and silica being present in the proportion of 100 parts of cement to 30 to 90 parts by weight of silica, shaping, strongly compressing, and removing excess water from the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to steam at a temperature above atmospheric.

14. A composition of matter comprising an intimate mixture of Portland cement, asbestos fibres, and finely divided admixed silica, the proportion of the cement being in excess of the proportion of asbestos, the admixed silica being in the proportion of 30 to 90 parts by weight to 100 parts of the cement, the said composition being in compressed and hardened condition, and the said silica being largely chemically reacted with basic components of the cement.

16. A composition of matter adapted for use in the form of building slabs, sheets, shingles, pipes, and the like, said composition being characterized by its relative high structural strength and resistance to corrosion and being com-

posed essentially of the reaction product of partially setting in the absence of steam under pressure and then substantially completely curing in the presence of steam under pressure an intimate mixture including asbestos fibres, water, Portland cement and silica, said cement and silica being present in the mixture in finely divided form and in the proportions of 100 parts of cement to 30 to 90 parts by weight of silica.

7. That an appeal was taken and entered on December 7, 1938, from the rejection of the above claims, to the Board of Appeals of the Patent Office. Said Board of Appeals duly heard said appeal and on April 6, 1940, acting for and on behalf of the Commissioner of Patents, rendered a decision sustaining the decision of the Primary Examiner rejecting the above-noted claims and also the following claims, which had been previously entered by amendment:

18. In making a cementitious composition, the method which includes forming a mixture comprising water, Portland cement, asbestos fibres and admixed finely divided silica, shaping the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to steam under super-atmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica being 30 to 90 parts silica to 100 parts Portland cement.

4 19. In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture accompanied with the application of pressure, subsequently applying additional pressure to the shaped mixture, then allowing the shaped and compressed mixture to take an initial set and partial cure, and subjecting the initially set material to steam under super-atmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used

being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement.

20. In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture accompanied with the application of pressure, then allowing the shaped mixture to take an initial set and partial cure, and subjecting the initially set material to steam under superatmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement.

21. In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture, subsequently applying pressure to the shaped mixture, then allowing the shaped and compressed mixture to take an initial set and partial cure, and subjecting the initially set material to steam under superatmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement.

8. The grounds advanced by the Board of Appeals in its rejection of the application claims were that no invention is involved in the claims of the application in view of a patent to Schumacher patent No. 1,003,813, issued September 19, 1911, and a patent to Sanger, No. 1,223,834, issued April 24, 1917.

* * * * * * * * * *

Paragraph 9 here omitted as it includes claims not passed on by Patent Office.

* * * * * * * * * *

10. On reconsideration the Board of Appeals re-affirmed its previous decision on the basis that, in its opinion, applicants have not contributed a patentable advance.

11. That the Commissioner of Patents has since refused said application and now refuses to grant the plaintiffs a patent on said invention as stated in the claims noted above.

12. That the plaintiffs have not taken an appeal from, nor other proceeding seeking a reversal of, said decision of said Board of Appeals other than the instant Bill of Complaint.

13. That cementitious articles, i.e., articles made of asbestos and cement, have been made for a great many years and in a great many forms of final commercial products; that prior to the advent of the instant invention said products were inferior due to low resistance to the action of soluble sulfates, disintegration by soft waters, efflorescense, inability to withstand high temperature and low strength, and such products could not be used with success in fields of industry where asbestos cement products were subjected to severe usage in the above respects.

7 14. That following the completion of the invention of said Ernest W. Rembert and Edward M. Jenkins, wherein certain critical proportions of fine silica were admixed with asbestos and Portland cement and the materials highly compressed and cured under substantial steam pressure, the strength of such products has been greatly increased, and other desirable results achieved, to such an extent that, despite the increased cost of added equipment and the controls thereof and increases in the cost of plant operations, the invention is now used by the plaintiff Johns-Manville Corporation in the production of products such as asbestos-cement pipes and building slabs, sheets, shingles and similar products, having a market value of approximately ten million dollars ($10,000,000.), for the year 1939.

15. That the problem of improved asbestos-cement products had been before the industry for a great many years without solution and the invention as disclosed and claimed in said application Serial No. 15,352 constitutes a major contribution to the general improvement of asbestos-cement products.

16. That in general, details of said invention and the manner of constructing and using the same have become known throughout the United States through the sale of products produced in accordance with the invention and therefore, unless the rights of plaintiffs in said invention be recognized by the United States Patent Office and by this Honorable Court, plaintiffs' invention will be pirated by others and plaintiffs' rights will be jeopardized and plaintiffs will suffer great damage and irreparable injury.

17. That the decision of the Primary Examiner in rejecting the claims noted above was erroneous and contrary to law and that the decision of the Board of Appeals in sustaining said rejection was erroneous and contrary to
8 law; and that the action of the Commissioner of Patents in refusing to grant a patent on said claims was erroneous and contrary to law; and that the plaintiffs are without other remedy or relief except by this Bill.

Wherefore, the plaintiffs pray:

1. That this Honorable Court judge and decree the plaintiffs, Ernest W. Rembert and Edward M. Jenkins, to be the original, first and joint inventors of the invention set forth in their said application Serial No. 15,362, and particularly as set forth in claims 13, 14, 16, 18, 19, 20, and 21, thereof, as amended, copied in paragraph No. 9 above, and decree that Letters Patent of the United States thereon be issued to them or to plaintiff Johns-Manville Corporation as their assignee with the above noted claims.

2. That this Honorable Court issue an order to the defendant, the Commissioner of Patents, to grant Letters Patent for said invention as specified in claims 13, 14, 16, 18, 19, 20, and 21 of the said application, and for such additional claim or claims as may be found by this Honorable Court to define the said invention; and that said patent be issued in the name of said Ernest W. Rembert and Edward M. Jenkins or said Johns-Manville Corporation as their assignee.

3. That the defendant be required to show cause why the plaintiffs should not have the relief hereby prayed or any thereof, if such can be shown, and make full, direct and perfect answer (but not under oath, an answer under oath being hereby expressly waived), according to the best of his knowledge, remembrance, information and belief, to the several matters hereinbefore averred and set forth in the several paragraphs of this Bill.

9 4. That it may please this Honorable Court to grant unto plaintiffs a writ of subpoena *ad respondendum* issuing out of and under the seal of this Honorable Court, directed to the defendant, Conway P. Coe, Commissioner of Patents, commanding him to appear and to make answer unto this Bill of Complaint and to perform and abide by such orders and decrees as to this Honorable Court may seem required by the principles of equity and good conscience.

5. And for such other and further relief as may seem just and proper.

ERNEST WAYNE REMBERT
EDWARD M. JENKINS

JOHNS-MANVILLE CORPORATION

By VANDIVER BROWN
Secretary.

C. W. FAIRBANK
VIRGIL C. KLINE
Attorneys for Plaintiffs

LEE B. KEMON
Local Solicitor
1331 G Street, N. W.
Washington, D. C.

Di. 3870

* * * * * * * * * *

(Note: Verifications on original not printed.)

* * * * * * * * * *

To the Honorable the Justices of the District Court of the United States for the District of Columbia.

1. Defendant admits the allegation of paragraph 1.

2. He admits the allegation of his official position and that he is sued in his official capacity. He states that while he is officially a resident of the District of Columbia, his legal residence is in the State of Maryland.

3. He admits the allegations of paragraph 3.

4. He admits that on April 9, 1935, the plaintiffs Ernest W. Rembert and Edward M. Jenkins, claiming to be the original, first and joint inventors of certain alleged new and useful improvements in Cementitious Composition and Article and Method of Making the Same, filed application for Letters Patent therefor in the United States Patent
13 Office, in which they made averments corresponding
to the allegations of paragraph 4. He denies that such allegations are sufficient to justify the issuance to plaintiff of a patent.

5, 6, 7 and 8. He admits the allegations of paragraphs 5, 6, 7 and 8.

9. He admits that on May 11, 1940, an amendment to the claims was filed. He states that claims 13, 14, 16, 18, 19, 20 and 21 in their amended form as set forth in paragraph 9 of the complaint were not entered in the application and were never considered by the primary examiner or the Board of Appeals and are not the proper subject matter of this action.

10. He admits the allegations of paragraph 10.

11. He admits that he has refused and still refuses to grant plaintiffs a patent containing claims 13, 14, 16, 18, 19, 20 and 21 as set forth in paragraphs 6 and 7 of the complaint. He denies that such refusal is wrongful or that plaintiffs are lawfully entitled to a patent containing said claims since these claims are deemed to be unpatentable

over the following prior patents and for the reasons as given in the statements of the examiner in answer to the appeal and the decisions of the Board of Appeals, copies of which will be furnished at the trial:

Schumacher,	1,003,813,	Sept. 19, 1911,
Sanger,	1,223,834,	Apr. 24, 1917.

Profert of copies of these patents is hereby made.

He denies that claims 13, 14, 16, 18, 19, 20 and 21,
14 as set forth in paragraph 9 of the complaint were
considered by the Board of Appeals or that these
claims are the proper subject matter of this suit.

12. He admits the allegations of paragraph 12.

13, 14, 15, 16. He states that he is without knowledge or information sufficient to form a belief as to the truth of the allegations of paragraphs 13, 14, 15 and 16.

17. He denies that his refusal to grant plaintiffs a patent containing claims 13, 14, 16, 18, 19, 20 and 21 as set forth in paragraphs 6 and 7 of the complaint, is erroneous or contrary to law or that the action of the primary examiner in rejecting said claims and the action of the Board of Appeals in affirming said rejection is erroneous or contrary to law for the reasons aforesaid.

W. W. COCHRAN
Solicitor, U. S. Patent Office,
Attorney for Defendant.

September 24, 1940.

I hereby certify that a copy of this Answer was mailed to the attorney for plaintiffs on September 24, 1940.

W. W. COCHRAN
Solicitor.

* * * * * * * * * *

II.

TESTIMONY.

17 In the District Court of the United States
for the District of Columbia

No. 8129.

Ernest W. Rembert, Edward M. Jenkins, Johns-Manville Corporation, *Plaintiffs*,

vs.

Conway P. Coe, Commissioner of Patents, *Defendant.*

Washington, D. C.,
Wednesday, November 12, 1941.

Pursuant to notice theretofore given to all known interested parties, and designation theretofore made by the Assignment Commissioner, the above-entitled cause came on for hearing and trial at 10:30 o'clock a. m., Wednesday, November 12, 1941, in the District Court of the United States for the District of Columbia, in the court house in the city of Washington,

Before

Honorable Daniel W. O'Donoghue, Associate Justice of the District Court of the United States for the District of Columbia, and the following were

Present:

Clair W. Fairbank, Esquire, Virgil C. Kline, Esquire, and Lee B. Kemon, Esquire, in behalf of the plaintiffs;
W. W. Cochran, Esquire, in behalf of the defendant.

18 Thereupon the following proceedings and transactions were had and testimony was taken:

(Following the opening statements this ocurred:)

Mr. Fairbank: I offer in evidence a certified copy of the file wrapper of the application involved in this suit as Exhibit 1.

(Thereupon the file wrapper was received in evidence and marked by the reporter "Applicants' Exhibit No. 1, R. E. M., 11/12/41".)

Testimony of Ernest Wayne Rembert.

Thereupon **Dr. Ernest Wayne Rembert** a plaintiff herein, was called as a witness for and in behalf of the plaintiffs, and being then and there duly sworn by the Clerk of the Court, assumed the witness stand and, upon examination, testified as follows:

The Clerk of the Court: State your full name.

The Witness: Ernest Wayne Rembert.

Direct Examination

By Mr. Fairbank:

Q. You are one of the applicants in the application before the Court, and one of the plaintiffs in this case? A. I am.

Q. Where is your residence, and what is your occupation? A. I am a research supervisor for Johns-Manville Company. I live in Plainfield, New Jersey.

Q. And the plant is at Manville, New Jersey? A. That is right.

Q. What has been your education and experience along chemical lines, and particularly involving the uses of cement—your education? A. I have a bachelor's degree, and
a master's degree in chemical engineering from the
19 Missouri School of Mines, and I have a doctor's degree from the Massachusetts Institute of Technology.

Q. What have you been working on since you got your doctor's degree, and what is the nature of your work with

Johns-Manville Company? A. My work has been principally on asbestos cement products as development supervisor.

Q. How long have you been working in that field? A. Eleven years.

Q. What was the standard, the generally approved method of making asbestos cement products prior to the filing of the application here involved? Just describe generally what the workmen do in making the product. A. In making the product the practice was to form a mixture with an excess of water, then remove that by—

Q. (interposing) Mixture of what? A. Asbestos and cement.

Q. Anything else? A. No; remove the excess of water by compression and filtration; then allow the product to set and cure in a moist atmosphere, or under water, for a period of twenty-eight to thirty days prior to shipment.

Q. Why was this long period of curing necessary? A. That is a characteristic of ordinary Portland cements to require that period for strength and development, or for the development of sufficient strength for which the product is intended.

Q. What is the general percentage of asbestos and cement commonly used in such products? A. The percentage of asbestos varies over a rather wide range, generally within the range of ten to fifty per cent by weight, the remainder being cement.

Q. Most such products are between twenty-five and forty per cent asbestos? A. The majority are in that range, that is right.

Q. And the other sixty to seventy-five per cent being the cement? A. That is right.

Q. Now, when you speak of cement in this case you mean the ordinary, standard Portland cement? A. That is right.

Q. Now, when we speak of normal cure are we to understand that in each and every case that it means this long period of going on towards thirty days in a moist atmosphere? A. Normal curing implies in the industry a curing for a period of twenty-eight to thirty days in a moist atmosphere, or under water.

Q. Does that same term apply in connection with sand and cement products? A. Yes, the same practice is used.

Q. This long period of you say twenty to thirty days, or how long? A. Generally in our industry it is twenty-eight to thirty days.

Q. Twenty-eight to thirty days; is that long period necessary, for instance, in making concrete roads? A. Yes, sir, it is good practice on a road to protect the road from loss of moisture for a period of about three weeks.

Q. How do they do that? A. They do it by either
21 covering with oil or by a straw or burlap covering
and periodically wetting it down.

Q. That is the purpose of this straw and burlap covering you see on freshly laid concrete roads? A. Yes.

Q. That is to keep the product moist for a long period during the setting? A. That is right.

Q. The term "steam curing" will be used frequently in connection with this case. Will you explain what is meant in the industry by the term steam curing? A. We understand steam curing to mean subjecting the article to the action of saturated steam above atmospheric pressure.

Q. For about how long a period of time? A. From eight to twenty-four hours.

Q. And that steam pressure is applied how long after your cementitious product is molded, or shaped, or formed? A. The product is allowed to obtain a partial set and air cure for a sufficient period so that it can be handled, that is generally about twenty-four hours, before it can be placed in saturated steam.

Q. Now, you get a pre-set and partial cure for about twenty-four hours in the air, and then a final cure for about twenty-four hours in steam under pressure? A. In steam under pressure.

Q. And at the end of that two days' period is the product thoroughly set and in final condition? A. The products obtained by our process are stronger at the end of that period

than if they were allowed to air cure for twenty-
22 eight to thirty days.

Q. In other words, you reduce the time from twenty-eight to thirty days down to about forty-eight hours? A. About forty-eight hours.

Q. And the steam curing of asbestos and cement products is not particularly different than the steam curing of cement and sand products so far as the procedure is concerned, is it? A. The procedure and the equipment are the same.

Q. Is a mortar mix a sand and cement mixture? A. That is right.

Q. If you steam cure a mortar mix, that is the sand and cement, is the product stronger or weaker than it would be if it had been cured by the normal cure? A. The product obtained is from ten to thirty per cent stronger as a result of steam cure than is obtained at the end of thirty days normal curing.

Q. That is with sand and cement? A. That is right.

Q. Now, if you use exactly that same procedure of steam curing with an asbestos cement product what is the result? A. Instead of gaining strength we have found that we lose approximately sixty-five per cent of the normal cured strength on steam curing.

Q. In other words, steam curing of a sand and cement mixture increases the strength, and steam curing of an asbestos and cement product decreases the strength? A. It
decreases the strength to a point where it is an im-
23 practicable method; in other words, the product is
less than half as strong as a result of steam curing as compared to normal curing.

Q. Was this method ever practical prior to this? A. No.

Q. Was the reason that it was not, because it practically ruins the products? A. We know that the process is impracticable.

Q. Your company never did any steam curing of asbestos and cement products prior to this invention? A. No.

Q. Now, if you take a sand and cement mixture and add a fine silica and then subject it to normal curing, is the product stronger or weaker than it would be if the fine silica had been omitted? A. There is a loss in strength obtained on normal curing of such a mixture, the loss being in proportion to the amount of fine silica added.

Q. Are you talking of asbestos and cement or sand and cement? A. I am speaking of sand and cement. The same general result is obtained with an asbestos-cement mixture.

Q. And with an asbestos-cement mixture, if you add fine silica and normal cure you get a loss in strength? A. Yes, there is a loss in strength about in proportion to the amount of fine silica added.

Q. In other words, am I correct in my understanding that steam curing asbestos and cement reduces the strength, and adding of silica to asbestos and cement in normal
24 curing decreases the strength? A. That is right.

Q. Are those same things true in regard to a sand cement mixture? A. No, in the case of a sand cement mixture, steam curing results in a ten to thirty per cent increase in strength, but the addition of fine silica to normal curing results in a decrease in strength.

Q. Now, with a sand and cement mixture, if you increase the percentage of cement in respect to the sand, do you make the product stronger or weaker? A. The strength of a mortar increases with the increase in amount of cement used.

Q. The larger the amount of cement the stronger the product of sand and cement? A. That is generally known.

Q. Now, if you increase the amount of cement in an asbestos cement mixture under normal conditions, what is the result? A. Working in commercial composition, the addition of more cement to an asbestos cement mixture reduces the strength of the product.

Q. And that is directly the opposite— A. (interposing) The opposite of a sand and cement mixture.

Q. Now, if you knew that steam curing of a sand cement mixture increases the strength, would you assume that the use of sand cement mixture with asbestos would like-
25 wise increase the strength? A. We made that as-

sumption and tried it, ran some experiments along that line. The products that we actually obtained were weaker, were sixty-five to seventy per cent lower in strength, than normal cured products of asbestos and cement of the same general composition.

Q. Even though you steam cured a sand and cement mixture containing asbestos? A. Yes.

Q. If it had not contained any asbestos it would have been stronger, wouldn't it, by steam curing? A. Yes.

Q. And by taking that mixture, which increases in strength on steam curing, and putting asbestos into it you do not get an increase in strength; is that right? A. We suffer just the same loss on steam curing, that is, sixty-five to seventy per cent of the normal cured strength, with a mixture of that type, as is obtained with a mixture of asbestos and cement alone.

Q. You stated that you had made some tests in regard to steam curing of asbestos and cement mixtures to determine the strength? A. That is right.

Q. You have tried that out? A. Yes.

Q. Have you any data to show the results of your test? A. Yes, we do.

Q. Now, just what is shown on this sheet that you have before you; take up first Series 1? A. This is Table 2 of Transverse Strength Tests of Normal and Steam Cured Transite, that is the trade name for our asbestos
26 cement board. In Series 1 a composition containing forty per cent of asbestos fiber and sixty per cent Portland cement was consolidated into a sheet in the conventional manner, air-cured for forty-eight hours, then subjected to the action of steam at 100 pounds per square inch pressure for periods of from one to forty-eight hours. The strength of the Transite decreased steadily and reached a minimum at a twenty-four hour period, with practically no change when the curing was carried to forty-eight hours, as shown in line 1 of Table 2—

Q. (interposing) Series 2. A. On Series 2.

Q. Just a minute. On all these tests, test Series 1, you used the same composition in all the experiments? A. That is right.

Q. And you had the same forty-eight hour pre-air curing? A. That is right.

Q. And this Series 1 proves what fact? A. Series 1 proves in conjunction with the normal cured strength, as shown in line 1 of Series 2 for the same composition, that a loss in strength of approximately sixty-five per cent is obtained on steam curing an asbestos cement product.

Q. If the strength of a normal cure, as in line 1, Series 2, as given, were 3,830 square pounds per square inch to force a rupture, that is the way it is made? A. These strength figures are in terms as determined under
27 beam tests.

Q. Just what is a beam test? A. Placing the member on two supports, load it in the center to the point of failure under the load, and compute the modulous of rupture from the specimen.

Q. Then this first series of tests proves something that should be avoided with the asbestos and cement mixture? A. Definitely, and these results have been confirmed in a large number of tests which we have run along the same line.

Q. Now, if you take that same forty-sixty mixture which has a strength of 3830 on normal curing, and now suppose you progressively increase the amount of silica in that with normal curing, what does this sheet show? A. The effect of the addition of silica on normal cured specimens is shown in Series 2.

Q. Under the heading of "Normal Cure"? A. Under the heading of normal cure; this shows a gradual reduction in strength from 3830 pounds per square inch to 2250 pounds per square inch, as the ratio of silica to cement goes from zero to one.

Q. In this table lettered "P. C." at the top of the third column, that means what? A. Portland cement.

Q. And the number 200 silica is what? A. Fine silica to pass through a 200 mesh.

Q. That is, it is barely visible? A. It is a very fine powder, best known in the trade as silica flour.

28 Q. Now, do these tests establish that the addition of silica to a Portland cement and asbestos cement product decreases the strength? A. Yes, and the first test shows that steam curing decreases strength to the extent of less than half.

Q. Now, what else does Series 2 show in its bearing on the present invention? A. Series 2 shows also the effect of steam curing mixtures containing fine silica cement and asbestos fiber according to our process. It shows that by adding fine silica the strength is increased from 1500 pounds per square inch to a maximum of approximately 4850 pounds per square inch; that is, the steam cured product containing somewhere near the optimum of fine silica content is twenty-five per cent stronger than the conventionally normal cured product, whereas a sheet containing no admixture silica is sixty-five per cent lower in strength than the normal cured product.

Q. What do the figures show in the column headed 'Normal Cure'' under Series 2? A. These figures show the actual reduction of strength obtained by using admixture fine silica in the composition.

Q. Then, as I understand, what is covered by the claim here before the Court is the product made, and the result which is shown under the heading of "Steam Cured," Series 2, the middle four figures, 4455 to 4865, is that correct? A. Yes, the invention covers a range slightly below the figures of .33 and greater than .71.

Q. Those figures are in the final column? A. In the final column.

29 Q. But the four figures, 4455 to 4865, are the middle of the range of what is covered in this? A. That is true.

Q. And do these figures show the relative amount of improvement as against steam curing without silicia in the Series 1 of the same column? A. Yes, they do.

Q. And as against normal curing with added silica in the column directly to the left? A. That is true.

Q. Now, what is shown in Series 3 on this table? A. In series 3 the effect of using mixtures of sand and cement with asbestos fiber is shown, and in this the same proportion of asbestos was used as above, and the various proportions of Ottawa sand, which is the standard type of sand used for cement testing, various proportions of sand were substituted for cement, and the resultant products both steam cured and normal cured.

The addition of sand resulted in a decrease in normal cured strength, depending upon the amount of sand used.

Q. That is, it went from 38 — A. (interposing) Starting with 3830 in line 1 of Series 2, as containing zero sand, then the reduction went from 3830 to 2820.

Q. That is for normal curing? A. For normal curing.

Q. Yes. A. When these compositions were steam cured in the same manner as those in Series 2, strengths varying from only 1300 pounds per square inch to 1420 pounds per square inch were obtained, and these were slightly lower than obtained on the mixture of asbestos and cement as shown in line 1 of Series 2, so, compared with the normal cured strength obtained of 3830 it is sixty-five to seventy per cent less on steam curing.

Mr. Fairbank: In the file wrapper of the application here involved, on page 120 there is a table apparently showing the result of tests. Now, there is a copy, not that, not that big one, the little one with the brown cover, at page 120 you will find it with this kind of a table (indicating).

The Court: You go ahead; I will find it.

By Mr. Fairbank:

Q. Did you make the tests that are recorded in that table? A. Yes.

Q. And, by the way, did you make the tests that are recorded in this third table? A. Both groups were made under my supervision.

Q. Now, what is shown by the data on Table 1 at page 120 of the file wrapper, Exhibit 1? A. These tests in Table 1 were all made on standard mortar briquettes.

Q. No asbestos in any of those? A. There is no asbestos in the formula as used on Table 1.

Series 1 in this table shows the effect of substituting fine silica for a portion of cement in a one to two mortar, in other words, a mortar containing initially one part cement to two parts of sand.

31 Q. That is shown here as 33.3 and 66.7? A. That is right. In line 1 of Series 1 the normal cured strength of the one to two mortar used was 563 pounds per square inch.

The steam cured strength of that same composition was 738 pounds per square inch, or an increase of twenty-three per cent by simply steam curing mortar instead of normal curing for twenty-eight days.

Q. But you previously testified that this same steam curing of an asbestos cement product decreased the strength? A. To an extent of about sixty-five per cent.

Q. All right, go ahead. A. These tests also show in Series 1 that the substitution of fine silica for cement in mortar mix gradually reduces the strength on normal curing in proportion to the amount of silica added.

Q. That is in the last column? A. In the last column.

Q. Where the strength decreases from 563 down to 361? A. That is true.

Q. What else does this table Series 1 show? A. Series 1 shows that there is a slight advantage to be gained through the substitution of fine silica for cement, the optimum proportions being about .25 to one, and the increase in strength amounting to less than ten per cent.

Q. .25 to one, that is outside of the range of the claims here? A. That is true. In Series 2 similar data are presented for a one to three mortar.

32 Q. That is twenty-five cement and seventy-five sand? A. Sand, and here again the steam cured heating strength is greater than the normal cured strength with no admixture silica, the difference being only about ten per cent in this case.

Q. And the maximum increase in strength with the silica is what? A. Is only about .10 or .11.

Q. That is eleven parts silica to 100 parts cement? A. That is right.

Q. And that is likewise outside the range? A. That is likewise well outside of our range.

Q. What does Series 3 show? A. Series 3 and 4 present similar data substituting a minus forty sand, that is a sand all of which passes a forty mesh screen.

Q. It is similar to Series 2, except it is a different kind of sand? A. A different kind of sand, and the same general conclusions apply except that a maximum strength is obtained with no admixture fine silica. In other words, with a minus forty sand the steam cured strength is a maximum when there is no substitution of silica for cement in the mixture.

Q. That is shown by the figure 507 in the first line of Series 3? A. That is true.

Q. And the more fine silica you added the weaker the product? A. The weaker the product, yes, and the same thing is true in Series 4.

33 Q. And Series 4 is the same as 3 except the ratio of sand and cement is—A. (interposing) Three to one.

Q. Three to one instead of two to one? A. Yes.

Q. Now, Series 5 shows what? A. Series 5?

Q. Is that pertinent? A. It is not pertinent.

Q. All right, then don't bother with it. A. All right.

Mr. Fairbank: I offer in evidence the sheet marked Table 2 as Exhibit 2.

(Thereupon document entitled "Table 2, Transverse Strength Tests of Normal and Steam Cured Transite," was received in evidence and marked by the reporter "Applicants' Exhibit No. 2, R. E. M., 11/12/41.")

By Mr. Fairbank:

Q. You heard the Solicitor from the Patent Office this morning state that Schumacher teaches the proper percentage of fine silica to add, did you not? A. I did.

Q. Do you agree with that statement? A. No, we do not consider Schumacher to be pertinent to this invention.

Q. I mean, does the percentage of silica which will give the maximum strength on steam curing of a sand and fine silica composition, as you have just testified to, come within the range of the claims of the present case, range as
34 to percentage of silica?

Let me state that again: What is the percentage of silica that gives the maximum amount of strength in a steam cured sand and cement mixture as you have just testified? A. It will vary with the size of the sand, the nature of the sand, and the ratio of sand to cement used.

Q. Now, what was it when you were using standard Ottawa sands? With what percentage of silica did you get the maximum strength? A. It varied—

Q. (interposing) On a two to one mixture? A. On a two to one mixture the maximum strength was obtained at about 0.25 to one.

Q. Now, with the three to one mixture the maximum strength is where? A. The maximum strength is at a ratio of about 0.1 silica to one part of cement.

Q. Is that what you call banding sand? A. Yes, that is banding sand.

Q. Now, for any of those figures you have just given, does the maximum strength come within the range where you have discovered the greatest strength occurs in an asbestos and cement admixture? A. They do not.

Q. Then does Schumacher teach, when tested out in the laboratory, the conditions under which the proper amount of silica should be added? A. To an asbestos?

Q. In testing out the Schumacher invention with the results that you obtained for maximum strength, at
35 which you realized maximum strength would be in a cement asbestos mixture? A. No, not necessarily.

Q. In other words, they are outside the range entirely? A. For the specific type of materials which we tested and use our conventional mortars.

Q. Now, were you familiar with the Schumacher patent at the time you made your invention? A. No, we were not.

Q. If you had been, what influence do you think that would have had upon the situation? A. It would have had no influence in my opinion. We were familiar with the art of steam curing mortars and concretes at the time we started this work. The published information by six or seven competent investigators taught us that an increase in strength of a mortar with concrete ranging from ten to thirty per cent could be expected on steam curing.

Then we found on steam curing an asbestos cement mixture under exactly the same conditions, we not only did not get an increased strength, but we lost sixty-five per cent of our normal strength, and so we naturally assumed, and rightfully so we thought, that the art as taught for concrete and mortar mixtures does not apply to asbestos cement products.

We did not know why they did not apply; we thought it might be due to some disintegrating action on the asbestos as the result of the steam treatment. We thought it might be some chemical combination of asbestos with ce-
36 ment. There were a number of possibilities, or possible reasons, why we obtained such a radical difference in behavior between an asbestos cement product and a mortar and concrete on steam curing.

Q. I note that the Schumacher patent refers to using two parts sand to one part of cement; is that two parts of asbestos to one part cement practical? A. It is not a commercial product.

Q. Regardless of how it is treated, is that right? A. The only use for products of that type are bases for impregnation with resins, or some other material.

Q. The Schumacher patent was granted in 1911. Do you know whether that invention has ever gone into commercial use? A. The invention definitely was not in commercial use up to a period of about five years ago.

Q. You think it may have gone into use recently, or don't you know? A. I am not sure.

Q. You never knew of any use of the Schumacher process up to about five years ago? A. Oh, no, and I have never seen it mentioned in the literature on the subject of steam curing.

Q. Were you familiar with the Sanger patent No. 1,223,834, relied on by the Patent Office, at the time you made your present invention? A. No, I was not.

Q. When I say you, yourself, I wish to be understood as saying when you and Mr. Jenkins made your joint
37 invention? A. We were not.

Q. Do you know what effect that might have had on your research program had you known of it? A. Had we known of it, and accepted the results obtained by trying his example, we would have been discouraged, and probably would not have continued our work.

Q. Why is that? A. Following the example of Sanger in steam curing, in the sense that we know it, the product obtained is not any different than that obtained without adding any silica within the limits of experimental error. In other words, the product of Sanger, when steam cured, is also about sixty-five per cent weaker than a normal cured material of the same composition, which is almost exactly the result we obtained with no admixed silica.

Q. What are the relative proportions or parts used by Sanger? A. Sanger uses five parts silica to eighty parts of cement in his example.

Mr. Cochran: To fifteen parts asbestos?

The Witness: Yes.

By Mr. Fairbank:

Q. That would be about—A. (interposing) It comes to about .065 parts silica to one part cement.

Q. And that is outside the range as defined in the claims here in issue? A. It is well outside the range, and the product is outside the range of commercial possibili-
38 ties.

Q. Does Sanger, in your opinion, represent any step forward in the art as of the date of his patent? A. No.

Q. Does he get a better product or worse product by practicing his process than you get by normal curing? A. He gets a product which is sixty-five per cent lower in strength than would be obtained in normal curing.

Q. In other words, it is a step backward in the art? A. Definitely.

Q. Has your invention gone into commercial use? A. Yes, sir, it has.

Q. By what company? A. Johns-Manville Corporation.

Q. When did they begin putting it into use? A. In 1935.

Q. Will you state briefly the types of products which are made by means of this process? A. The process is used for curing roofing and siding shingles, pipes, flat and corrugated sheets.

Q. Let's first consider the question of pipe. Under what trade name is that? A. Transite.

Q. Transite pressure pipe? A. That is one form. The material is also used as sewer pipe, flue pipe, electrical conduit, and vent pipe.

Q. Is this booklet I have in my hand a publication of the Johns-Manville Company regarding Transite pressure pipe? A. Yes, sir, that is a sales brochure.

39 Mr. Fairbank: I offer that in evidence as Exhibit No. 3.

(Thereupon the booklet referred to was received in evidence and marked by the reporter, "Applicants' Exhibit No. 3, R. E. M., 11/12/41.")

By Mr. Fairbank:

Q. Will you glance at this booklet and point out any particular points you think are of interest in showing the value of this product commercially? A. On page 3, at the bottom of the page, the extremely smooth inside surface of the pipe is illustrated, and the increased flow rate resulting from that smoothness of the inside surface is shown in the two hydrants on page 4, and the data on page 5.

The non-corrosive nature of the material is shown as affecting flow rates on pages 6 and 7. In other words, where metallic pipes are subject to corrosion, and lose their carrying capacity over a period of years, this type of pipe is corrosion-resistant and maintains its flow rate.

Q. For this pressure pipe what are the distinctive advantages over competing products, and what are the competing products on the market? A. The competing products are cast iron, protected steel, and galvanized iron pipe in the smaller sizes, and reinforced concrete pipe for low-pressure work.

Q. How strong are these pipes? What is the object of strength so far as pipes are concerned? A. Transite pipe is made, all the pressure pipe is made in four classes for working pressures of fifty to two hundred pounds per square inch, and every piece of pipe is tested to four times the rated working pressure before it is shipped from the factory. In other words, a pipe designed for two hundred pounds working pressure would be hydrostatically tested at the factory to eight hundred pounds per square inch.

Q. What other strength factors are important in the pipe? A. In smaller diameter pipes the beam strength is important, and in sewer pipe and thin wall water pipe the crushing strength of the material under external load.

Q. What do you mean by beam strength? I mean, how does that come into this picture so far as pipes are concerned? A. In laying pipe they are apt to be supported on two stones in the trench, possibly ten or twelve feet apart; then, as the earth is back-filled that weight is applied to the top of the pipe and it is bent, as a beam supported at or near the two ends.

Q. What sizes are employed in these pipes? A. Two inch to thirty-six inch.

Q. That is, two inches in diameter up to thirty-six inches in diameter? A. Up to thirty-six inch diameter.

Q. And what lengths? A. The pressure pipe is made in thirteen foot lengths, except for two and two and a half inch, which are ten foot lengths.

Q. Are cast iron or steel pipes subject to corro-
41 sion? A. Yes, definitely.

Q. Does that apply to this Transite pipe? A. Transite pipe is much more resistant to corrosion, either normally or resulting from electrolysis, than are metallic pipe.

Q. How about acids or alkalies in the soil that might have an effect? A. Transite pipe is well known to be corrosion-resistant in contact with weak acids, mine waters, and it has been proven to be immune to the action of soluble sulphates, which is one of the major disintegrating agents your Portland cement products encounter in this country.

Q. And that is particularly true out in the West? A. In the West and Southwest.

Q. Do acids in the soil affect it in any way?

Mr. Cochran: If the Court please, I should like to make this statement; the Patent Office has not questioned the utility of this product, nor its commercial success. I do not see why all this testimony is coming in to prove something that is not in question. I don't see the point.

Mr. Fairbank: There are many decisions of the Courts, and particularly the Court of Appeals of our Circuit here, that in case of doubt on the question of patentability, the doubt should be resolved in favor of the applicant where there has been large commercial success. Now, what is meant by "large commercial success"? What is commercial success is a question of degree, and trivial success might not be sufficient to have any effect whatever on the question
of patentability, but where something has revolution-
42 ized the whole industry and driven all competing
products off the market, and is dumbfounding, we

certainly want to prove it. I do not want to take any more time than necessary, and I will cut it as short as I can, but I feel it is necessary to show the effect on the industry.

The Court: Mr. Cochran is taking the position that it is not necessary to go into too much detail, not that the testimony was on the question of how good it was.

Mr. Fairbank: On the question of how good it was, and the extent to which the public has taken it.

By Mr. Fairbank:

Q. Will you explain very briefly the economies, if there are any, in the manufacture of not merely the pipe but the other products made under the present invention, from the standpoint of the factory, and the manufacturer, regardless of the customer advantage? A. The economies from a manufacturing standpoint are primarily in connection with carrying lower inventories. In other words, we are able to manufacture and ship products of this type at the end of forty-eight to seventy-two hours, whereas normally these must be held for twenty-eight to thirty days if a normal cure operation is used.

Now, in certain sections of the country there is always some economy in materials depending on the cost of fine silicas as compared with Portland cement, but those are the principal manufacturing advantages.

Q. Does the question of space required to store thirty
days' production amount to anything? A. That is
43 serious, and this has been a very valuable contribu-
tion in cutting down on space requirements.

Q. In other words, if you are making thirty-six inch pipe you might cover hundreds of acres in a thirty-day period waiting for it to get ready for sale? A. That is true.

Mr. Fairbank: I don't want to encumber the record, but I have a sample of one of the pipes, and I can offer it in evidence if you wish, or whatever you want done with it.

The Court: The Court doesn't mind.

Mr. Fairbank: I offer a sample of Transite pressure pipe as Exhibit No. 4.

(Thereupon the sample of Transite pressure pipe was received in evidence as "Applicants' Exhibit No. 4.")

By Mr. Fairbank:

Q. Now, so far as shingles are concerned, is this invention being used in making asbestos cement shingles? A. Yes, sir, it is, we are making all of the asbestos siding shingles by this process, and some of the roofing shingles.

Q. What is the advantage in so far as shingles are concerned? A. The principal advantage from the standpoint of shingles is that the moisture expansion and contraction is only about twenty-five per cent as great with a product made by this method as obtains on a normal cured product, and that gives us a corresponding reduction in the tendency of the shingles to warp and curl and open at the joints. It also permits us to make and sell a type of roofing shingle which would be impractical to make by any other
44 method. This shingle is thirty inches long and has certain definite economies to the customer so far as initial cost and cost of application are concerned.

Q. Are the two booklets I hold in my hand typical of the advertising literature of the Johns-Manville Company regarding these shingles? A. That is true.

Mr. Fairbank: I offer the two booklets as Plaintiffs' Exhibits 5 and 6.

(Thereupon the two booklets referred to were received in evidence and were marked by the reporter, "Applicants' Exhibit No. 5, R. E. M., 11/12/41," and "Applicants' Exhibit No. 6, R. E. M., 11/12/41.")

By Mr. Fairbank:

Q. Is the shingle I hold in my hand one of those you said would be entirely impractical without this process? A. That is the long roofing shingle which would be impractical from a curling and warping standpoint if this process were not available, and also it would be impractical to furnish a shingle of those dimensions having a thickness of only about .15.

Q. That is about a quarter of an inch? A. That is slightly over one-eighth of an inch. By normal curing we could not produce a shingle that thin.

Q. And by making it thinner you save the cost of material? A. Yes.

Q. Why is this ridged appearance shown here? A. Just to make it look better on the roof.

45 Q. Just a matter of appearance? A. Yes, sir.

Mr. Fairbank: I offer a sample of shingle as Plaintiffs' Exhibit No. 7.

(Thereupon the sample of shingle referred to was received in evidence as "Applicants' Exhibit No. 7.")

By Mr. Fairbank:

Q. You said something about making a corrugated product? A. Yes, sir.

Q. Is this a sample which I hold in my hand? A. Yes, sir.

Q. What is this used for? A. Used principally for industrial roofing and siding.

Q. Is this booklet I hold in my hand one advertising this corrugated product? A. That is right.

Mr. Fairbank: I offer in evidence a sample of the corrugated board as Plaintiffs' Exhibit No. 8, and the booklet regarding it as Plaintiffs' Exhibit No. 9.

(Thereupon the sample of corrugated board referred to was received in evidence as "Applicants' Exhibit No. 8," and the booklet regarding it was received in evidence as "Applicants' Exhibit No. 9.")

By Mr. Fairbank:

Q. Now, about when did these various products come on the market as made in accordance with your invention? A. Siding and shingles and Transite pipe and Flexboard were started in production in 1935, and have continued ever since. That large roofing shingle was developed and 46 placed into production in 1937, as was the corrugated Transite.

Q. Are there any new products you have brought out made possible by the use of this invention that were not really practicable without it, aside from that thirty inch shingle? A. Transite pipe was not considered to be practical for use in this country when made according to European practice, and it received only—that is, it was not really favorably received until our process was adopted.

Q. That is because you get greater strength for the same weight? A. That is right.

Q. There is one other item that you referred to, that is the Flexboard. Are these samples I have in my hand? A. Those are samples of our Flexboard.

Q. What are they used for principally? A. Principally as wainscoating, and dry wall panels in bathrooms, kitchens and restaurants and similar places.

Q. How thick are those? A. Those are one-eighth, or slightly under.

Q. They are slightly flexible? A. They are quite flexible. That board, an eight-foot length, can be bent on a radius of about twenty-six inches.

Q. Would that product be practical if it were not for your invention? A. In the so-called decorative line we do not think it would be practical. We obtain color clarity and extension characteristics that are necessary for the types of construction it is used for.

47 Mr. Fairbank: I offer in evidence three samples of Flexboard as Plaintiffs' Exhibits 10-A, B and C.

(Thereupon the three samples of Flexboard were received in evidence as "Applicants' Exhibits Nos. 10-A, B and C.")

Mr. Fairbank: And I offer in evidence the booklet regarding the Flexboard as Exhibit No. 11.

(Thereupon the booklet regarding the Flexboard was received in evidence as "Applicants' Exhibit No. 11.")

By Mr. Fairbank:

Q. To what extent, merely in general terms, has this process gone into commercial use from a dollar standpoint? A. I don't know exactly.

Q. You are not in charge of the books on sales? A. No. I understand that this year our total business in products made by this method will be about $15,000,000.

Mr. Fairbank: That is all.

Cross-Examination

By Mr. Cochran:

Q. Doctor Rembert, you were not the inventor of steam curing for cement products, were you? That was done before your invention? A. On concretes?

Q. Yes, sir. A. That is right.

Q. The steam curing process is not your invention? A. No, that is right.

48 Q. And neither did you invent the mixture of cement and asbestos; I mean that as a practical proposition that was not your invention? A. No.

Q. That was done before your work, wasn't it? A. That is true.

Q. Now, in your original claims in this case it seems to me you claimed the proportions of added silica to the cement in some theoretical way. You did not in those claims specify any particular proportions.

Perhaps this will recall it. Later you amended your claims to call for anywhere from fifteen to one hundred parts of added silica to the one hundred parts of cement. Do you recall that? A. Yes, sir, I recall that change.

Q. And now the claims call for thirty to ninety parts of added silica to one hundred parts of cement? A. Well, we considered—

Q. (interposing) How do you explain that? A. We consider the range of thirty to ninety parts of added silica to be within the range of this invention.

Q. But apparently earlier you considered that from fifteen to one hundred parts would also be within the scope? A. Fifteen to one hundred parts?

Q. Fifteen to one hundred parts of added silica to one hundred parts of cement? A. That is in the ratio of .15 to one on the lower limit, and one to one on the upper limit.

Q. So now your claims are restricted to a lesser range,
namely, three-tenths to nine-tenths of added silica to
49 one part of cement? A. That is right.

Q. I wish you would consider that in connection with the drawing of your application. Do you have a copy of that there? A. I have that here, I think.

Mr. Cochran: May it please your Honor, that will be found as Item C of the Exhibit.

By Mr. Cochran:

Q. Now, with what proportion of added silica to cement do you get the best result there? A. The best, the highest experimental point shown on this chart is .58. You will notice the point is above the curve?

Q. Yes. A. The maximum on the curve strikes about .54 as drawn.

Q. That is to say, when you add to ordinary Portland cement 54 parts of added silica to one hundred parts of cement you get the optimum result? A. In an asbestos cement product.

By Mr. Fairbank:

Q. But not in a sand and cement? A. Not necessarily.

By Mr. Cochran:

Q. I believe that on page 3 of your application you give a formula for ordinary Portland cement? A. I have that here. It is an analysis, is it not?

Q. Perhaps I can shorten my examination in this way—

Mr. Fairbank (interposing): It is in that record
50 down below.

The Witness: This is a duplicate analysis.

By Mr. Cochran:

Q. Of ordinary Portland cement? A. Yes, sir.

Q. So the silicon dioxide which is actually present is already nineteen parts? A. That is true.

Q. In ordinary cement, and the calcium oxide, or lime, is 63.6? A. Yes.

Q. Now, will you take up the patent to—

The Court (interposing): Suppose we recess until 1:30.

(Thereupon at 12:30 o'clock p. m. recess was taken until 1:30 o'clock p. m. this date.)

51 After Recess

(Pursuant to recess theretofore taken, the consideration of the above-entitled matter was resumed at 1:30 o'clock p.m., when the following proceedings and transactions were had and testimony was taken:)

Proceedings, Transactions, and Testimony

Thereupon Dr. Ernest Wayne Rembert was recalled as a witness for and on behalf of the plaintiffs, and having been previously duly sworn by the Clerk of the Court, resumed the witness stand and, upon further examination, testified as follows:

Cross-examination (resumed)

By Mr. Cochran:

Q. Doctor, I will ask you now to refer to the Schumacher patent, 1,003,813. Do you have a copy of that? A. Yes, sir, I do.

Q. You will note in column 1 of the first page that the patentee speaks of adding quartz powder to the cement. Quartz powder is silica, of course, is it not? A. That is right.

Q. You will note that he says, beginning at line 29, first column of page 1, "By a great number of trials it has been established that the greatest strengths result if to the cement so much quartz powder is added, that the quantity of the latter together with the silica of the cement is approximately equal to the amount of lime."

Now, considered in connection with that statement the formula which is given in your application for Port-

52 land cement, how many parts—I will put it this way:

That statement of Schumacher means, does it not, that he adds forty-four parts of silica to the Portland cement? A. That would be his approximate proportion computed on the analysis included in our specification.

Q. Yes. A. But we attempt to follow Schumacher on this basis, using a one to two mortar mix that he recommends, and we find that the optimum proportion of silica is about twenty-five per cent of the cement, and the strength obtained as a result of that addition over the standard mortar amounts to only about nine per cent.

Q. In other words, you disagree with his conclusion that that will give greater strength? A. We know that the amount of silica to be added to a mortar mix will vary over a wide range depending on the proportion of cement and sand used, the type of sand used, and the type of cement used.

Q. But my question is, take your formula of cement, and his statement means that he adds forty-four parts of silica to the cement? A. That is right.

Q. And that is, of course, within thirty to ninety parts? A. That is right.

Q. Now will you consider the Sanger patent, No. 1,223,834? In what respects do you consider that your method, and your product, distinguishes from the dis-
53 closure of Sanger? A. In the first place, our process
is a commercially practical process, whereas the process as disclosed by Sanger is not; in other words, it is not practical to operate using a formula he proposes that will reduce the strength of the product to less than half of that obtained on normal curing.

Q. There is a distinction, then, between his process and your process which brings about that difference? A. Yes, sir, that is true.

Q. What is that difference? A. We don't know exactly. It depends on how Sanger has interpreted it. The one thing that we are certain of, however, is the fact that the proportion of silica which we use is much greater than is suggested by Sanger.

Q. Can you think of any other difference between the two? A. Any other difference would be presumptuous.

Mr. Cochran: I think that is all.

Redirect Examination

By Mr. Fairbank:

Q. You have defined in your previous testimony, Doctor Rembert, steam curing. Do you find any reference to using steam under pressure greater than the atmosphere in the Sanger patent? A. No.

Q. Then would you say that Sanger discloses the use of steam curing in the sense in which you have defined it in this case? A. We would presume that Sanger does
54 not use steam curing in the sense we have defined it,
because he certainly would not have considered a process as practical which would result in a decrease of greater than half the normal cured strength.

We presume that he has reference to a practice used in Europe of simply curing cement products in an atmosphere of saturated air which is maintained saturated by the injection of steam.

Q. Where he says on page 2, line 15, "The highly pressed article is treated with steam to effect the silification in the surface portion," that does not mean to you that the steam was under pressure, or does it? A. Not necessarily.

Q. He doesn't say whether it is under pressure or whether it isn't? A. No.

Q. And if he put it under pressure he would greatly reduce in strength? A. Yes.

Q. And if he did not put it under pressure he would get somewhere near his normal strength? A. That is true. He would obtain somewhere near that. That is commercial practice in Europe.

Q. Therefore, assuming he is desiring a steam cured product, you would necessarily assume that his steam was not under pressure? A. That is right; and we would go further and assume he is curing in saturated steam, and even at atmospheric pressure he would be curing at temperatures about 140 degrees Fahrenheit.

55 Q. That is not steam curing? A. No.

Q. And he does not suggest how long he subjects it to steam temperature, does he? A. No.

Q. I think I asked you before, but to make sure I will ask you again: Do you know, or did you ever hear, of any product being put on the market comparable with what is described here in the Sanger patent? A. No, I have not.

Q. That applies from your first knowledge of this industry up to the present time? A. And also a considerable knowledge of the history of the industry.

Q. Does Schumacher state any percentage, or any definite figures of the amount of silica that he proposes to add? A. He states in terms of the cement analysis the approximate proportions which he has found desirable. There are no definite figures.

Q. And you have found that the same two to one, that is two parts of sand to one of cement, that Schumacher calls for, and using standard Portland cement, the highest strength under steam curing is 25 instead of the about 40 per cent that would result from computation of the formula of the cement? A. The maximum strength is obtained with a silica cement ratio of about .25, and that only represents an increase of about 9 per cent over a mixture containing no admix fine silica.

Q. Then the maximum under Schumacher is a com-
56 paratively negligible amount, is that right? A. It is negligible compared with the correction we were forced to make on asbestos cement products in order to commercialize the process.

Q. To briefly recapitulate this case, please state whether or not this is a correct summary of your testimony so far as Schumacher and the Sanger patents are concerned: that if you steam cure an asbestos cement mixture you lose strength; if you steam cure a sand and cement mixture you increase strength; if you add silica to an asbestos cement and normally cure it you will lose strength; and if you add silica to an asbestos cement and steam cure it, using the proportion of silica that Sanger does, you get a poorer product than you would get using no silica at all and normally curing it; and using a cement sand mixture which strengthens on steam curing, and using that mixture with asbestos you get no increase on a steam curing or on normal curing? A. That is true.

Q. And increasing the amount of cement in respect to asbestos decreases the strength, and increasing the amount of cement in respect to sand increases the strength; are those statements a correct summary of what you testified? A. That is true.

Mr. Fairbank: That is all, Doctor.

(Thereupon the witness was excused and retired from the witness stand.)

Testimony of Leslie A. Baldwin.

57 Thereupon **Leslie A. Baldwin** was called as a witness for and on behalf of the plaintiffs, and being then and there duly sworn by the Clerk of the Court, assumed the witness stand and, upon examination, testified as follows:

The Clerk of the Court: State your full name, please.

The Witness: Leslie A. Baldwin.

Direct Examination

By Mr. Fairbank:

Q. Where do you live? A. In Greenwich, Connecticut.

Q. With what company are you connected, and what is your position? A. I am vice president of the Johns-Manville Sales Corporation.

Q. The sales corporation is, you might say, the division of the organization that has to do with the sales rather than manufacture? A. That is right.

Q. Are you familiar with the general volume of sales of the company for the last ten years? A. Yes, sir.

Q. Are you familiar with the sales of the special asbestos cement products made by your company under the present invention? A. I am.

Q. Have you refreshed your memory as to those figures and proportions, and ratio, and so forth? A. I have.

58 Q. About what was the total sales of Johns-Manville Company for the year 1931? A. Around $32,000,000, $32,385,000 I find in this memorandum.

Mr. Fairbank: I will not make an exhibit of this, your Honor.

By Mr. Fairbank:

Q. Now, what is the estimated total for 1941, which has got about six weeks yet to run? A. The estimate is $88,000,000. It is going to be somewhere between eighty-five and ninety million we feel sure.

Q. Now, I understand the asbestos cement products made under this invention came on the market in 1935; is that correct? A. That is right.

Q. You were making an asbestos cement product prior to 1935? A. Yes.

Q. What was the volume of your business in 1932 to '34 of asbestos cement products made prior to this invention, just briefly? A. In 1931 $381,000; 1932 $283,000; 1933 $344,000; 1934 $646,000.

Q. Are those the products that you converted over to the new practice by the adoption of this invention? A. Yes, as near as we could determine.

Q. In 1935, as soon as this invention was adopted by the company, where did the sales run? A. The sales increased to $1,589,000. 59

Q. And what are the estimated sales for 1941? A. $15,635,000.

Q. What were they in 1940? A. 1940 $8,684,000.

Q. Now, have you prepared any chart to show what the relative proportions of the sales of the asbestos cement products were as percentages of the total sales of the company? A. I have.

Q. About what was the percentage before you adopted the invention?

Mr. Fairbank: I will offer that as Exhibit No. 12.

(Thereupon the chart referred to was received in evidence as "Applicants' Exhibit No. 12.")

By Mr. Fairbank:

Q. About what was the percentage of these asbestos cement products to the total volume of business in 1931? A. That was in the neighborhood of 1.2 per cent.

Q. And what was it in about 1933 there? A. 1933, 1.8 per cent.

Q. And when you adopted this new process in 1935 how much did the sales go to? A. The percentage jumped to in the neighborhood of 5 per cent.

Q. Where did it go in 1940? A. In 1940 that percentage increased to 14 per cent.

Q. And what is your estimate of what it will be in 1941? A. Around 17.8 per cent.

Q. This is the ratio of the sales of products made
60 with this invention beginning in 1935 in respect to
the total sales of the company; is that right? A. Yes,
sir.

Q. In other words, the percentage of these products has been increasing faster than the percentage of the other products? A. Very much so, approximately fifteen times as fast.

Q. How about the advertising? We put in evidence some advertising circulars regarding these. Has the advertising expense of those products been greater or less, or approximately in the same proportion as the advertising expense of the other lines? A. I would say in the same proportion, not greater, at least in one or two of the products I am familiar with, so I know it is less.

Q. Then this great increase in sales has not been due to any strenuous advertising effort? A. That is correct.

Q. Have you prepared any charts of these increases in products of some of those figures you read off? A. I have.

Q. Is the chart I am handing to the Court that chart? A. It is.

Q. And that shows for the first four years a very small volume of sales?- A. It shows a volume of sales running from $381,000 in 1931 to $646,000 in 1934.

Q. And that was somewhere in proportion to the general increase in business of the company in those years,
61 or wasn't it? A. Yes, sir, I think those sales were very close to our general business; 1932 was a little less than 1931, as shown on the chart.

Mr. Fairbank: I offer in evidence the last chart produced by the witness as Plaintiffs' Exhibit No. 13.

(Thereupon the chart referred to was received in evidence as "Applicants' Exhibit No. 13.")

By Mr. Fairbank:

Q. And have you prepared any other chart with regard to the relative sales or percentages, or ratios, of this industry to the others? A. Yes, there is a third chart there; I haven't a copy of it.

Q. What does this chart show? A. This is a chart arranged to show the proportional increase in business, taking the year 1931 as a base to begin with, and it shows the proportional increase in our business over the next ten years, the total business over the next ten years, and then the upper chart A shows the proportional increase in our special asbestos cement products.

Q. How much did the general business increase in 1931-41? A. It shows in the years 1931-1941 that our total business, as shown by B in this chart, increased 2.7 times.

Q. And how much did your asbestos cement products increase in that same period? A. The asbestos cement products increased, as shown by the curve A, forty times during that ten years.

62 Q. And the sharp rise in that curve is following the year 1934 and beginning with the year 1935? A. That is right; beginning with the year 1935 this curve started straight up almost.

Mr. Fairbank: I offer this chart in evidence as Exhibit No. 14.

(Thereupon the chart referred to was received in evidence as "Applicants' Exhibit No. 14.")

By Mr. Fairbank:

Q. Are you at all familiar with some competing products that are on the market? A. Somewhat familiar with competing products.

Q. Did you ever hear of any product made under the Sanger patent that involved asbestos, cement and silica prior to 1935? A. No, sir.

Q. You, being in the sales department, would have probably known of it if there had, or wouldn't you? A. I think so.

Q. You make a business of keeping track pretty closely of what your competitors are selling? A. Yes.

Q. And you never heard of anything along that line before? A. No, sir.

Q. If your advertising hasn't been any greater for these products than for the other general lines, and they have increased in volume forty-one times since 1931, and the
general business has only increased 2.7 times, how
63 do you account for the difference? A. I am sure that
it is due to the general superior characteristics of
these products made by this special process. We know that because we have just watched the growth, and talked to customers, and found that the increased efficiency of our delivery, of the increased chemical resistance we have in the material, the lessened expansion and contraction to moisture have all helped greatly.

Q. Did you mention strength? A. I thought I did. Strength has been, of course, a great factor in that it has been possible to make pipes much lighter so that we have been able to reduce the expense of manufacture and cost of transportation.

Q. How did it affect the cost of transportation? A. We get a great deal more in the ordinary carload.

Q. The freight rate is less? A. The freight rate is less in that you get so much more in the same car; and we found it was much better where lead cables were involved in electrical work.

Q. You mean you have less corrosion, or just what do you mean? A. Less corrosion on the lead cable. Lead cable corrodes very little in these tubes.

Q. You mean the lead cable that encloses the electric conduit? A. The lead cable that encloses the electric conduit, the wires; they have had considerable trouble with cables in connection with ordinary concrete.

64 Q. Have you any theory as to why, or don't you know anything about that? A. I am not familiar with the full reason of that. It is something that has been definitely proven, however, and the customers have chosen this product on account of it.

Q. This product made under this process as against products made— A. (interposing) As against products we made before.

Q. And as against products made of sand and cement? A. That is correct.

Mr. Fairbank: Your Honor, I had some small photographs, but I think I may have slipped them loose—

The Court: I saw them.

Mr. Fairbank: I don't think that there is any use in introducing them in evidence.

The Court: You may include them as part of Exhibit 3.

Mr. Fairbank: That is all.

(Cross-Examination

By Mr. Cochran:

Q. Mr. Baldwin, how does the advertising expense compare on your cement and asbestos products in 1931 with what they were last year, for instance? A. I haven't got those figures exactly, but I believe the percentage of our total sales was higher than they were last year, I mean the percentage of total sales spent on advertising were higher because normally when sales are down we advertise more heavily, and go after business more strongly, than when they are up.

Q. You don't know whether you spent more last year in
advertising asbestos cement products than you did
65 in 1931? A. I would say that all of those things are
controlled by the percentage of the advertising and
proportioned as compared to what we estimated will be
spent, and I would say the percentage was higher back in
those early days than it is now.

Q. You say there are some competing products on the market? A. Yes.

Q. Do you know how they are made? A. In a rough way; I don't know exactly how they are made.

Q. Do you know whether any of them are made in connection with the Sanger patent, or do you? A. I am sure they do not follow the Sanger patent, if I understand the Sanger patent. That is the last one described?

Q. Yes. A. Where there was simply a curing at atmospheric pressures; no, I don't know of any that is being made.

Q. Have you made investigation so that you could answer that? A. I have on Transite pipe and conduit, and I find that those people cure the material by immersing it in large tanks of water, our competition.

Mr. Cochran: That is all.

Mr. Fairbank: That is all.

The Court: You are excused.

(Thereupon the witness was excused and retired from the witness stand.)

Mr. Fairbank: Plaintiffs rest, your Honor.

Mr. Cochran: May it please the Court, I offer in
66 evidence the exhibit for the defendant which com-
prises the copies of the Schumacher patent, the San-
ger patent, drawing of plaintiffs' application, the statement
of the Examiner on plaintiffs' appeal in the Patent Office,
and the decision of the Board of Appeals on appeal.

Mr. Fairbank: As I understand it, all of that is a duplicate of Exhibit 1 except the two patents, is that right?

Mr. Cochran: That is quite possible.

The Court: As Defendant's Exhibit No. 1.

(Thereupon the documents referred to were received in evidence as "Defendant's Exhibit No. 1," the file containing the following:)

"A—Schumacher, 1,003,813
B—Sanger, 1,223,834
C—Print of Drawings,
D—Examiner's Statement,
D′—Examiner's Supplemental Statement, dated July 15/39,
E—Supplemental Examiner's Statement, dated Mar. 12/40,
F—Decision of Board of Appeals,
G—Decision of Board of Appeals on Request for Reconsideration."

Mr. Fairbank: And all of those papers are in our exhibit with the exception of the two patents?

Mr. Cochran: That is quite possible, I think, yes.

The Court: Is there any further testimony by either side? The testimony is all closed. Do you want to make a little summary on each side?

67 Mr. Fairbank: I would like to have the privilege of submitting a brief, particularly on the law pertaining to the case, but I am prepared to argue the law as well as the facts, if that is in accordance with your Honor' wishes.

The Court: I don't mind. I like oral argument more than briefs, but if you want to file a brief there is no use of duplicating it. What is the law on which there is any controversy?

(Thereupon counsel argued the case.)

The Court: I will take it under advisement. You may take those all back except these (indicating), and then I will let you know about the decision.

(Thereupon the instant hearing was concluded.)

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EXCERPTS FROM PLAINTIFFS' EXHIBIT I.

Specification of Application as Filed.

84 This invention relates to a composition of matter comprising Portland cement and admixed silica, to articles containing the composition, and to the method of making the same.

The art of Portland cement compositions containing admixed silica is extensive and highly developed. However, we have discovered a proportion of admixed silica which gives such superior results that either decreasing or increasing the proportion from that which we have established as critical decreases the strength of the cured composition or the suitability for various uses. Particularly favorable results are obtained when reenforcing fibres of the type of asbestos are preesnt also and when the method of making involves special steps that will be described below.

The invention is illustrated in the drawing, in which

Fig. 1 shows graphs illustrating the effect of steamcuring upon asbestos and Portland cement compositions, one composition containing no admixed silica and the other containing silica admixed in the proportion of approximately 1 part by weight to 2 parts of Portland cement;

Fig. 2 shows the effect upon strength of the use of the critical proportion of admixed silica;

Fig. 3 shows an end view of a section of a tubular product made in accordance with the invention; and

Figs. 4 and 5 show edge views of porous articles made according to the invention.

To produce compositions of properties or articles of types illustrated, there is first made an intimate mixture of the solid ingredients, including Portland cement and admixed silica, with sufficient water to render the mixture castable or flowable. The mixture is then shaped. If asbestos fibers are included, the shaping may include compression in a filtering mold or otherwise, to remove
85 excess of water and thoroughly consolidate the solid
ingredients. The cement in the shaped mixture is

then precured, as by standing in a damp room at approximately atmospheric temperature, for a period that may extend from several hours to a day or more. This setting gives a product adapted to be handled and treated as described subsequently. After the initial set is obtained, the composition is then subjected to curing under the influence of pressure steam for a selected period, such as 28 to 36 hours.

When asbestos and Portland cement compositions are made as described, but without admixed silica, and are subjected to pressure-steam-curing, there is observed a lower strength at the end of the twenty-four hour curing period than at the start, as shown in graph A, Fig. 1, in spite of the fact that in some cases there may be a moderate increase in the strength during the first few hours of steam-curing.

On the other hand, the asbestos and cement compositions containing admixed silica, as shown by graph B, Fig. 1, increase in strength steadily and largely, up to and including the end of the twenty-four hour curing period. At the end of this period, the composition comprising the admixed silica has a modulus of rupture that may be more than three times as large as that of the composition into which no silica was originally admixed.

The graph C shows one indication of the critical nature of the proportions of admixed silica to Portland cement, in compositions comprising these two ingredients and asbestos and made as described above.

As the proportion of silica is further increased, beyond the range shown in graph C, there is additional substantial decrease in the strength of the resulting composition after steam-curing. In a typical experiment, the use of 1.5 parts by weight of silica to one part of Portland
86 cement, in a composition comprising these ingredients and asbestos, lowered the modulus of rupture to approximately 2,500 pounds. Increasing the proportion of admixed silica to 3.5 parts to 1 part of Portland cement lowered the modulus still more.

The invention will be more specifically illustrated by operating details in connection with a composition containing Portland cement, asbestos, admixed silica and napthalene. The naphthalene is incorporated originally as filler, the subsequent removal of which produces porosity and lightness of weight of the finished product such as illustrated in Fig. 4. It is to be understood that similar operating details may be used with the omission of the naphthalene and of the special step necessary exclusively for its removal, if the function which the naphthalene serves is not desired.

There are first provided suitable raw materials.

The cement used is of the Portland cement type. Such cements comprise basic components including, particularly, a high proportion of lime and lesser amounts of magnesia, alumina, and iron oxide. Such cements include also a large proportion of silica, this component being largely combined, presumably, in the form of di- and/or tri-silicates. A typical cement used contained the principal ingredients in about the following proportions:

Formula of Ingredient	Parts by Weight
SiO_2	19.4
Al_2O_3	7.2
Fe_2O_3	3.0
CaO	63.6
MgO	3.4
SO_3	1.8

87 In such a composition, it is assumed that the sulphur trioxide (SO_3) is combined as calcium sulphate, the calcium therein being unavailable for further reaction as a basic component.

Silica is provided in finely divided form, as, for example, in the form of fine Ottawa (Illinois) sand of which approximately 98% is adapted to be passed through a 100-mesh screen. In other tests, we have used this sand of a degree of fineness such that most of the sand could be passed through a 200-mesh screen. For the purposes of the invention, it is desired that the silica be in form adopted to react, preferably to substantial completion, with the basic components of Portland cement during treatment with pressure steam.

The reenforcing fibres may be of the type of asbestos. Fibres of this type include, for example, the fiberized minerals chrysotile, crocidolite, and/or amosite. In general, the fibres used should have no harmful chemical reaction with other ingredients of the composition and should be indestructible under all conditions to which they are subjected. Thus, they should be not decomposable at the temperatures to which they are subjected during the manufacturing operations. We have used to advantage chrysotile asbestos fibres of length such that substantially all may be passed through a 4-mesh screen and approximately 50% by weight through a 10-mesh screen, in the standard asbestos screening test.

The filler should be of the type of naphthalene, that is, adapted to be converted to fluid form, as by fusion or volatilization, at the temperature of steam-curing or other temperature to which the composition containing the filler is subjected during the manufacture into finished porous articles. Such fillers include, besides naphthalene, paraffine wax or the like. The fillers are preferably used in the form of granules, say, of the order of the size adapted to be passed through a 10-mesh screen or finer.

88 Water is used in amount as desired to give a consistency that is most satisfactory in the particular apparatus or shaping process utilized. The silica ratio is preferably 0.4 to 0.6 part to 1 of cement. In a typical preparation there are used 100 parts by weight of Portland cement, 58 parts of admixed silica, 58 parts of chrysotile asbestos, 401 parts of granular naphthalene, and sufficient water to give a freely flowable mixture. The mixture is made intimate and flowed into the bed of a hydraulic press having a filtering bottom. Pressure is then applied by means of a large metal plate descending upon the mixture

in the said bed, the pressure being increased gradually until it reaches a maximum that may be approximately 1,500 pounds or higher to the square inch.

During this compression, excess of water is forced from the composition through the filtering base of the press and the remaining wet mixture is shaped, strongly compressed, and densified.

The thus shaped and compressed mixture is allowed to stand at ordinary temperatures and pressures, suitably in a damp atmosphere, and the cement therein thus caused to take an initial set slowly and a partial cure. Thus, the mixture may be allowed to stand for twenty-four hours. The initially cured material is then subjected to further curing by direct contact with saturated steam at superatmospheric pressure, as, for example, at 40 to 120 pounds gauge pressure, preferably, at about 100 pounds.

During this steam treatment, curing proceeds rapidly and the product is largely hardened in about twenty-four hours. During this period, there is also removal of the filler by liquefaction and volatilization, in the presence of the steam.

When the steaming is completed, the temperature may
be raised, as, for example, to 450° F. in the presence
89 of steam or inert gas, to complete the removal of any
volatile filler that may still be present.

The removal of filler develops voids 1 (Fig. 4) corresponding in the finished product substantially to the volume and spacing of the granules of filler present before the steaming operation. Pores or voids may thus be developed corresponding to 80% or more of the total volume of the finished product; yet, such material is of adequate strength for use as partition or other building material.

In another embodiment of the invention two materials may be united by an adhesive composition comprising Portland cement and admixed silica. Such an article is illustrated in Fig. 4.

To make an article of this kind there may first be shaped and compressed, as described, a composition comprising asbestos fibres, Portland cement, admixed silica, granular naphthalene or the like, and water. The shaped and compressed composition may be allowed to take an initial set and precured, say, for 24 hours, or there may be applied at once a layer of cementing material 2 comprising Portland cement, silica admixed in the critical proportion, and water, the amount of water used being that required to give a consistency adapting the composition to be spread over the shaped and compressed material.

There is provided also a sheet 3 of dense facing or finishing material, preferably made from a freely flowing composition of asbestos, Portland cement, admixed silica and water by the process of shaping and compressing in a filtering hydraulic press, as above described. This sheet 3 of finishing material in unset condition is placed upon the cement layer 2 and the resulting composite is consolidated, say, by a pressure roller drawn over the facing material 3 while the base material is firmly supported. Finally, the composite is subjected to pressure-steam-curing, whereby the naphthalene-containing base portion, adhesive layer 2, and facing material 3 are hardened simultaneously. Due to the component parts of the structure having been assembled in unset condition, migration takes place across the interfaces which promotes integrality and firmness of union in the finished product.

The composited article may be allowed to stand for a day or so at approximately atmospheric temperature to permit the Portland cement in all portions to assume an initial set and partial cure, after which curing under the influence of saturated steam at high pressure is undertaken. The naphthalene filler may be removed finally at an elevated temperature, as previously described.

It will be understood also that, if the feature of porosity of the base material is not desired, the use of naphthalene or the like is omitted. Likewise, asbestos may be omitted if its function is not desired. (Last sentence cancelled by amendment.)

The improved composition and method of the invention are adapted for use, also, in making a product such as illustrated in Fig. 5. In making such a structure, there is first

provided facing material in the form of strong shape-retaining sheets 4 comprising asbestos fibres, Portland cement, and admixed finely divided silica in the critical proportion previously disclosed. Between these facing sheets there is introduced a body portion 5 that advantageously is provided or adapted to be provided with voids 6 and to
be thoroughly united to the sheets 4. Before intro-
91 duction of the body portion 5, an adhesive layer of
Portland cement and silica, in the optimum proportions, may be applied to the inner surfaces of the facing sheets. The body portion 5 may be supplied by casting a suitable composition between the facing sheets 4, while the sheets are maintained in spaced substantially parallel relationship to each other, escape of the cast composition from between the spaced sheets at their edge portions being prevented by any convenient means. Preferably, the cast composition contains gas-generating agents, bubbles of gas, or other density-reducing means dispersed in an aqueous hydraulically setting composition, such as one including a large proportion of Portland cement or a similar material such as cement fondu. For optimum strength, silica admixed with Portland cement in critical proportion may be used. The cast composition is allowed to set or harden in position, so that it becomes thoroughly united to the two facing sheets 4, the whole composite suitably being subjected finally to pressure-steam-curing, to complete the hardening.

The result is a slab suitable for use as a building material which has dense relatively impervious faces and an inwardly disposed core that, although possibly much weaker than the material of the faces, is adequate to provide the desired beam or load-distributing effect when a stress is applied to a face of the unit. Also, the unit may be an effective thermal insulator.

92 A composition and article not containing voids is
illustrated by the pipe made from asbestos, Portland cement, and admixed silica and shown in Fig. 3.

In making such pipe, there is first made an aqueous suspension of asbestos, Portland cement, and admixed silica in the critical proportion described. The solid ingredients in wet form are then felted together and built up on a rotating mandrel to desired thickness, while being strongly compressed by overlying rollers. Apparatus and methods that may be used are described in U. S. Reissue patent 17,335 to Mattei and Mazza, dated June 25, 1929. Finally, the pipe of desired wall thickness is removed from the mandrel, the cement is allowed to assume an initial set and precure, and the product is subjected to steam-curing.

While the invention is not limited to any theory of the explanation of the results obtained, as, for example, those illustrated in the graphs, the following possible explanation is offered.

The initial setting of the Portland cement involves the
usual hydraulic setting to which Portland cement is
adapted. During the subsequent pressure-steam-curing,
there are produced reaction products of the admixed silica
with the basic components of the Portland cement. Thus,
the lime, magnesia, alumina, and/or iron components may
be converted largely or wholly to monosilicates. The pro-
portion of admixed silica corresponding to the maximum on
graph C, jointly with the silica originally present in the
Portland cement, represents almost exactly that propor-
tion required theoretically to convert the basic components
of the cement to monosilicates. It appears, also, that the
cement in the composition is no longer hydraulic after the
pressure-steam-curing and possible conversion to monosili-
cates has taken place. The resulting product, pos-
93 sibly for this reason, undergoes less change in vol-
ume on exposure to atmospheric conditions of vary-
ing humidity than observed with compositions made simi-
larly but without the admixed silica.

The proportion of admixed silica to Portland cement should be kept within close limits. There may be used approximately a half part of silica for one part of cement. The proportions of the reenforcing fibres and removable filler may be varied within wide ranges. Thus, there may be used reenforcing fibres in proportion ranging from 15 to 75% by weight of the total weight of all solid ingredients. The proportion of removable filler in the original mixture may range from none at all, to as much as 80% by weight of the total of all solid ingredients. We have used to advantage about 65 parts by weight of naphthalene in 100 parts of the mixture of Portland cement, silica, asbestos and naphthalene.

The above description and specific examples are to be taken as illustrative only. Any variation or departure therefrom which conforms to the spirit of the invention is intended to be included within the scope of the claims.

* * * * * * * *

DIV 15

#17

Fig. 1.

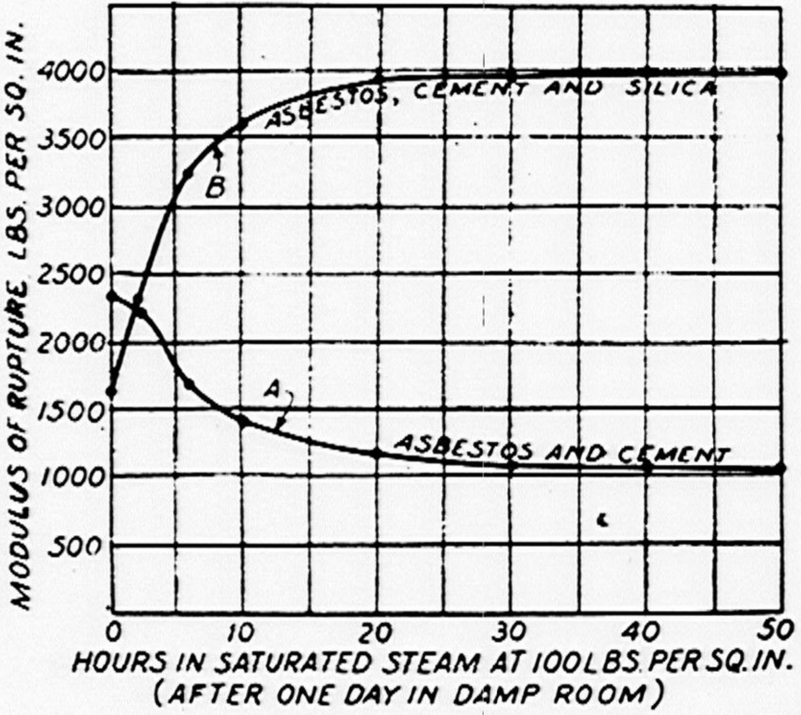


Fig. 3.

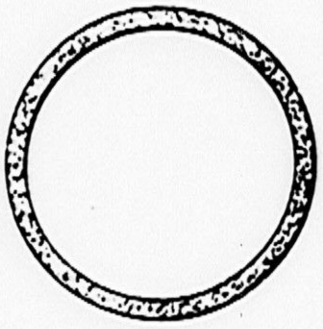
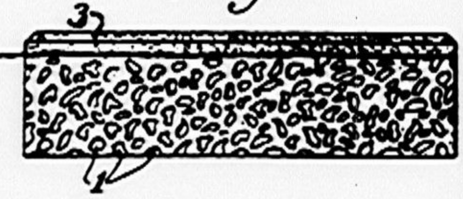


Fig. 4.



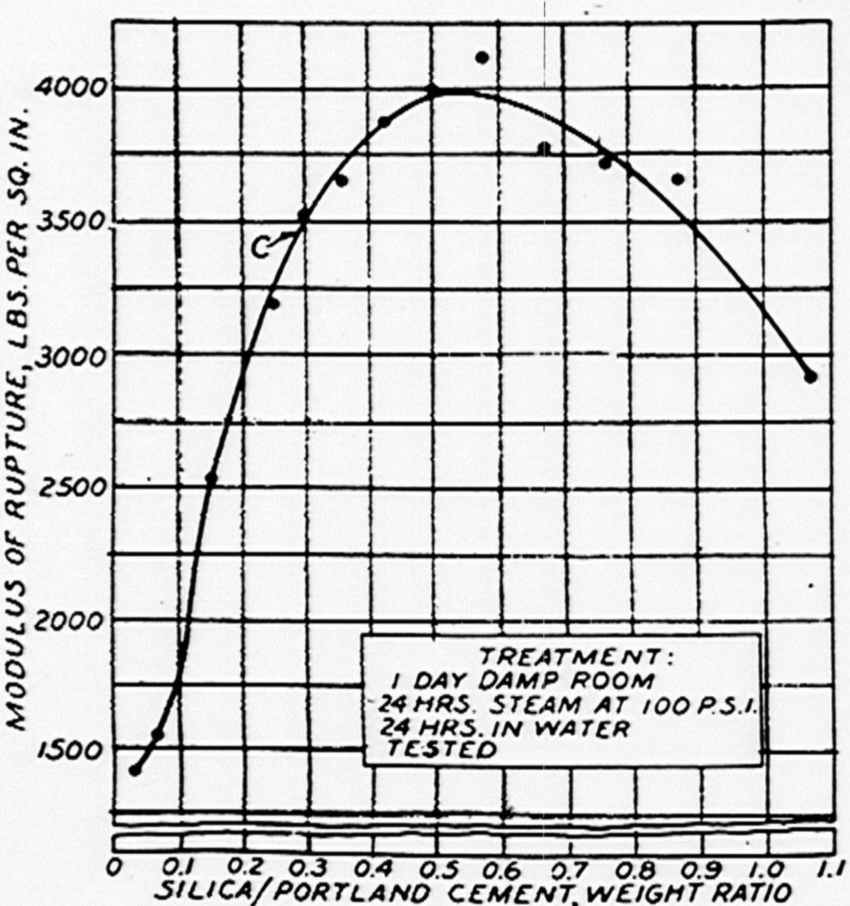
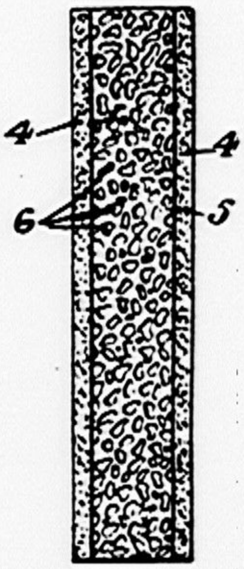


Fig. 2.

Fig. 5.



INVENTOR.
ERNEST WAYNE REMBERT.
EDWARD M. JENKINS.
BY D. N. Halstead.
ATTORNEY.

Tabulation Referred to App. p. 65.

203

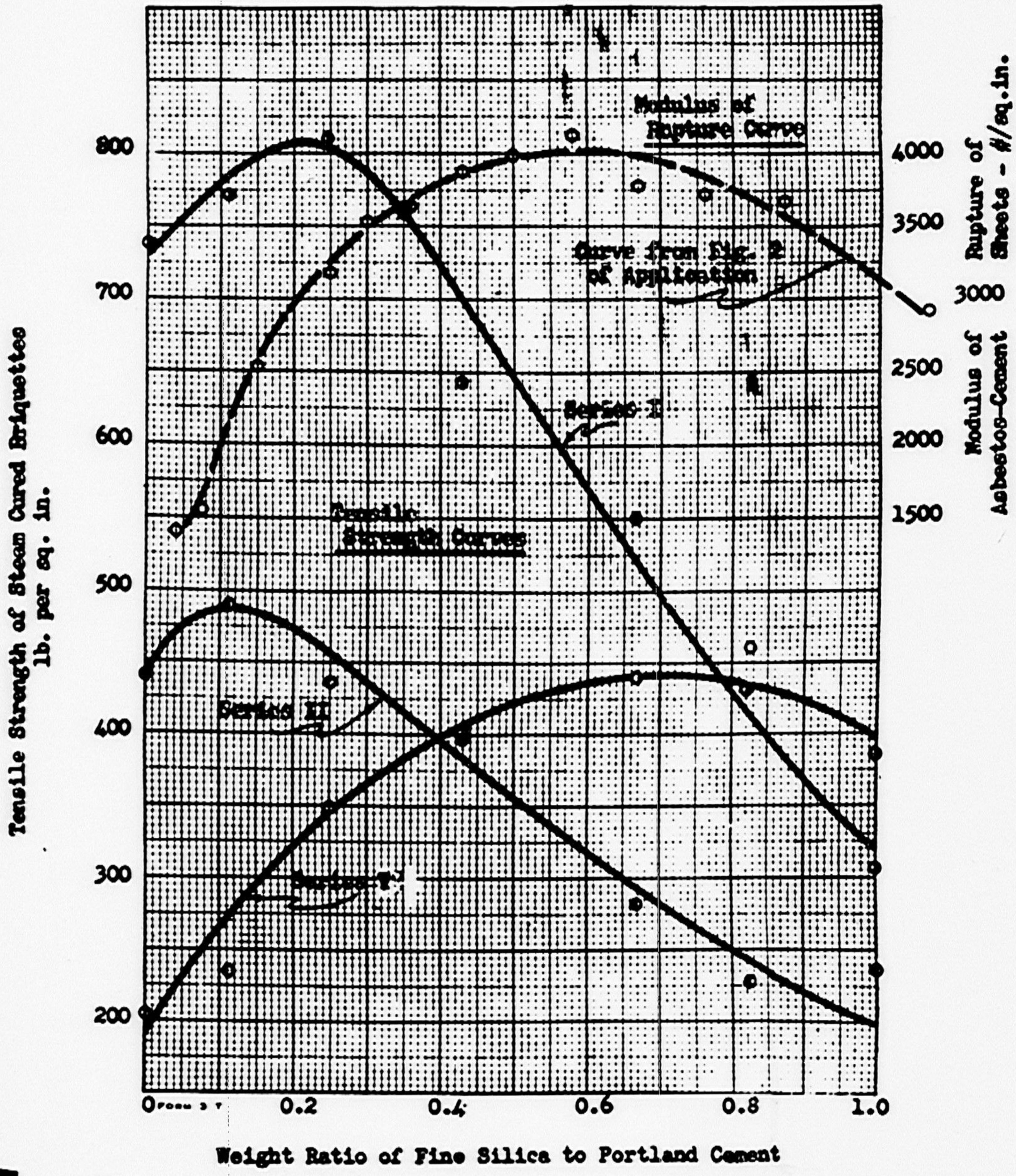
Johns-Manville Research Laboratories
Manville, New Jersey

Table I—The Effect on Tensile Strength of Normal and Steam Cured Mortar Briquettes Due to the Addition of Fine Silica.

	Composition of Briquettes (per cent)					#200 Silica:	Tensile Strength (lbs. per sq. in.)	
Test Series	Portland Cement	#200 Silica	—40 Banding Sand	Ottawa Sand	Limestone Sand	P.C. Ratio SiO$_2$/P.C.	Steam Cured	Normal Cured
I	33.3	0.0		66.7		0.00	738	563
"	30.0	3.3		66.7		0.11	771	498
"	26.7	6.6		66.7		0.25	810	479
"	23.3	10.0		66.7		0.43	644	445
"	20.0	13.3		66.7		0.66	550	408
"	18.3	15.0		66.7		0.82	431	368
"	16.6	16.6		66.7		1.00	306	361
II	25.0	0.0		75.0		0.00	440	401
"	22.5	2.5		75.0		0.11	490	333
"	20.0	5.0		75.0		0.25	436	321
"	17.5	7.5		75.0		0.43	397	320
"	15.0	10.0		75.0		0.66	282	259
"	13.7	11.3		75.0		0.82	228	248
"	12.5	12.5		75.0		1.00	236	261
III	33.3	0.0	66.7			0.00	507	369
"	26.7	6.6	66.7			0.25	351	319
"	23.3	10.0	66.7			0.43	292	290
"	16.6	16.6	66.7			1.00	233	219
IV	25.0	0.0	75.0			0.00	300	244
"	20.0	5.0	75.0			0.25	253	187
"	15.0	10.0	75.0			0.66	114	154
"	12.5	12.5	75.0			1.00	92	177
V	25.0	0.0			75.0	0.00	205	340
"	22.5	2.5			75.0	0.11	235	375
"	20.0	5.0			75.0	0.25	349	312
"	17.5	7.5			75.0	0.43	402	308
"	15.0	10.0			75.0	0.66	440	297
"	13.7	11.3			75.0	0.82	460	272
"	12.5	12.5			75.0	1.00	385	215

NOTE: Normal cured specimens were cured 28 days in water. Steam cured specimens were cured 3 days in fog and 48 hours in steam at a pressure of 100 lbs. per sq. in.

Curves Based on Table I on p. 59.



205 *Affidavit of Ernest Wayne Rembert*

New York, N. Y., February 5, 1940.

State of New Jersey,
County of Somerset, ss.:

Ernest Wayne Rembert, being duly sworn deposes and says:

That he is one of the inventors named in the application of Rembert and Jenkins for U. S. patent, Serial No. 15,362, filed April 9, 1935, for Cementitious Composition and Article and Method of Making the Same;

That he is a graduate of the Massachusetts Institute of Technology with the degree of Doctor of Science in Chemical Engineering, of the class of 1925, that from 1925 to 1930 he was Director of the Development Department of the Tide Water Oil Company and from that date to the present he has been Research Engineer and Research Supervisor for the Johns-Manville Corporation, with headquarters at the Research Laboratory, at Manville, New Jersey.

That, immediately after receiving the Examiner's Supplemental Statement, dated July 15, 1939, affiant initiated a research program in which cementitious products were manufactured to demonstrate the chemical reactivity of coarse siliceous sand with Portland cement. The resulting products were carefully studied and compared with products manufactured in accordance with the method described and claimed in the present application.

206 The formulations containing varying proportions of fine silica and different types of coarse sand, were prepared in the form of mortar briquettes some of which were subjected to normal curing and others to steam curing. The attached tabulation shows the actual formulations tested, ratio of pulverized silica to Portland cement and the tensile strength of the normal cured and steam cured products.

In the various formulations, the different raw materials had the following compositions:

(a) Portland Cement

Universal-Atlas Northampton Portland Cement was used for both the briquettes and sheets. This cement is of average grade and contains an average of 63% total CaO. A detailed analysis is given below:

Chemical Analysis

SiO_2	20.08
Al_2O_3	7.37
Fe_2O_3	2.51
CaO	63.24
MgO	2.94
SO_3	1.84
Loss on Ignition	0.94

(b) #200 Silica

This is a silica flour which contains a minimum of 99% SiO_2. It is ground so that all passes a 100 mesh screen and 90% passes a 200 mesh screen.

(c) Minus 40 Banding Sand

This is a fine silica sand which is finer than the Ottawa sand but coarser than the #200 silica. Its screen analysis is as follows:

Sieve No.	% Retained on Sieve
28	0.0
50	0.0
100	35.1
Pan	64.9
Total	100.0

This sand contains a minimum of 99% silica.

207 (d) Ottawa Sand

The Ottawa sand used in these tests is a graded silica having the following screen analysis:

Sieve No.	% Retained on Sieve
28	49.6
50	37.4
100	12.6
Pan	0.4
Total	100.0

The sand contains a minimum of 99% SiO_2.

(e) Limestone Sand

This material was made by crushing limestone, and after screening, recombining the fractions in proportions to give a grading similar to the Ottawa sand. The following is a screen analysis of the recombined fractions:

Sieve No.	% Retained on Screen
28	51.0
50	37.2
100	9.2
Pan	2.6
Total	100.00

In Series I appearing in the attached tabulation, test results are given for mortar briquettes made with varying proportions of Portland cement and fine silica mixed with 2 parts of standard Ottawa sand. These tests cover mixes in which the ratio of fine silica to Portland cement was varied from 0/1 to 1/1. Similar compositions were subjected to conventional curing in fog for 28 days and to steam curing for 48 hours at 100 lbs. per sq. inch after precuring specimens for 24 hours in air. The briquettes were tested according to conventional methods for strength.

The results obtained in these tests, show that the maximum tensile strength of steam cured mortars of the above

basic compositions is obtained with a ratio of fine silica to Portland cement of .25 parts fine silica to 1 part Portland Cement. Previous results in the curve 2 of the application drawing which cover the strength of steam cured cement-
asbestos composition wherein the proportions of fine
208 silica to cement were varied over a comparable range
shows the optimum silica ratio to produce a material
of maximum strength to be about .6 parts fine silica to 1 part Portland cement. The fact that a maximum strength is obtained in compositions using 2 parts of coarse silica sand to 1 part of Portland cement and fine silica, when the ratio of fine silica to Portland cement is .25 parts to 1 as compared with the optimum ratio of .6 parts silica to 1 part Portland cement, in the case of asbestos cement compositions, definitely demonstrates that the coarse sand as well as the fine silica is reacted chemically with the Portland cement in the mortar mixes. In both types of compositions an excess of silica acts merely as a filler and is detrimental to the strength of the product. In the case of the mortar briquettes, it will be noted that the strength of the steam cured product containing 2 parts of coarse silica, is a maximum of 810 lbs. per sq. inch for a fine silica ratio of .25 to 1, this strength reducing to 306 lbs. per sq. inch for a fine silica ratio of 1 to 1. At the ratio of .66 to 1, which is the approximate optimum for asbestos-cement compositions, the tensile strength of mortar briquettes is only 550 lbs. per sq. inch, a reduction of 260 lbs, per sq. inch from the maximum.

The reactivity of coarse silica in mortar compositions as compared with the asbestos fibres in asbestos cement compositions is further demonstrated by the strength of the two types of products when steam cured without the incorporation of fine silica in the mix. In the case of the mortar mixes covered in Series I of the attached table, the 1 to 2 mortar containing no admixed fine silica shows a strength of 738 lbs. per sq. inch on steam curing as compared with 563 lbs. per sq. inch, when normal cured in fog for 28 days. Furthermore, the strength of the steam cured 1 to 2 mortar

mix is only 72 lbs. per sq. inch less than the 810 lbs. per sq. inch maximum strength obtained for the optimum
209 proportion of fine silica. In the case of asbestos-cement mixtures, referring again to the curve in Fig. 2 of the application, the strength is 4,000 lbs, per sq. inch for the optimum fine silica ratio of .6 to 1, as compared with a strength of only 1,400 lbs. per sq. inch for a composition containing the same percentage of asbestos fibre with no admixed fine silica, both compositions being steam cured under comparable conditions. The small reduction in strength obtained on steam curing of mortars containing no admixed fine silica, as compared with asbestos-cement compositions containing no fine silica, is further evidence of the reactivity of coarse silica as compared with asbestos fibres. It should be noted also, that whereas mortars containing no admixed silica show an actual increase in strength on steam curing as compared with normal curing, asbestos-cement products show a very substantial reduction in strength when compared in the same manner. The mixture described above containing no admixed silica develops a strength of 3,400 lbs. per sq. inch on normal curing as compared with 1,400 lbs. per sq. inch on steam curing, thus showing the detrimental effect of steam curing on asbestos-cement products unless fine silica is used in the compositions.

In Series II in the attached tabulation, results are given covering 1 to 3 mortar mixtures in which various proportions of fine silica were substituted for Portland cement. The results obtained further prove the reactivity of the coarse silica, since the optimum ratio of fine silica is shifted to .11 parts of silica to 1 part of Portland cement, indicating that the increased proportion of coarse silica has satisfied a portion of the requirements of the cement which required fine silica in the richer mix previously described. While leaner mixtures containing higher proportions of coarse sand were not investigated, it is evident that with increase in the proportion of coarse silica used, the requirement of fine silica will approach zero.

210 In Series III and IV, mortar briquettes were made using 1 to 2 and 1 to 3 mixes in direct comparison with Series I and II, with the exception that the standard Ottawa sand was replaced by an intermediate fine banding sand of smaller average particle size. In these tests it was shown that this finer sand in the proportions of 1 to 2 and 1 to 3 satisfied the full requirements of the Portland cement for obtaining maximum strength and the addition of fine silica to such mixes was detrimental to the strength of the steam cured product. This demonstrated further that the fine silica requirement in mortar compositions is dependent upon the particle size of the coarse silica used.

In Series V, results are given wherein limestone sand of a particle size comparable with the coarse silica used in Series I and II was substituted in 1 to 3 mortar mixes. Limestone being calcareous in nature, is substantially nonreactive with Portland cement. The test results show that when using limestone sand the optimum ratio of fine silica to cement is in the range of .6 to .8 parts to 1, which is in approximate agreement with the results obtained when using asbestos in combination with Portland cement and fine silica. Furthermore, when using limestone sand, a substantial reduction in strength is obtained on steam curing a mortar mix containing no admixed silica as compared with normal curing of the same composition, a result also obtained on asbestos-cement compositions.

The products using the asbestos fibres, Portland cement and finely divided silica as claimed are in large commercial production.

ERNEST WAYNE REMBERT.

Sworn and subscribed to before me this 5th day of February, 1940.

ELEANOR HENDRICKSON
Notary Public of N. J.

My Commission expires Jan. 5, 1942.

• • • • • • • • • •

Examiner's Statement of Mar. 12, 1940.

On Appeal Before the Board of Appeals

In re: application of
Ernest Wayne Rembert et al
Serial No. 15,362
Filed April 9, 1935
For: CEMENTITIOUS COMPOSITION AND ARTICLE AND METHOD OF MAKING THE SAME.
Virgil C. Kline for Applicants.

Supplemental Examiner's Statement

The amendment and affidavit filed February 8, 1940 have been entered for the purpose of this appeal. Consequently, this appeal will proceed on the basis of claims 5 and 13 to 17, as amended, and newly added claims 18, 19, 20 and 21. No claims have been allowed.

The appealed claims are as follows:

5. In making a cementitious composition, the method which includes forming a mixture comprising water, Portland cement, and admixed finely divided silica, shaping the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to stream under superatmostpheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being 30 to 90 parts silica to 100 parts Portland cement.

13. In making a strong cementitious composition, the method which includes forming a flowable mixture comprising water, asbestos fibres, Portland cement, and admixed finely divided silica, said cement and silica being present in the proportion of 100 parts of cement to 30 to 90 parts by weight of silica, shaping, strongly compressing, and removing excess water from the mixture, then allowing the mix-

ture to take an initial set and partial cure, and subjecting the initially set material to steam at a temperature above atmospheric.

14. A composition of matter comprising an intimate mix-
ture of Portland cement, asbestos fibres, and finely divided
admixed silica, the proportion of the cement being in excess
of the proportion of asbestos, the admixed silica be-
213 ing in the proportion of 30 to 90 parts by weight to
100 parts of the cement, the said composition being in
compressed and hardened condition, and the said silica
being largely chemically reacted with basic components of
the cement.

15. A pipe or conduit for the conduction of fluids, characterized by its relative high structural strength and resistance to the corrosive influence of mineral salts commonly present in surface waters compared to conventional asbestos-cement pipe material, said pipe being composed essentially of the reaction product of partially setting in the absence of steam under pressure and then substantially completely curing in the presence of steam under pressure an intimate mixture including asbestos fibres, water, Portland cement and silica, said cement and silica being present in the mixture in finely divided form and in the proportions of 100 parts of cement to 30 to 90 parts by weight of silica.

16. A composition of matter adapted for use in the form of building slabs, sheets, shingles, pipes, and the like, said composition being characterized by its relative high structural strength and resistance to corrosion and being composed essentially of the reaction product of partially setting in the absence of steam under pressure and then substantially completely curing in the presence of steam under pressure an intimate mixture including asbestos fibres, water, Portland cement and silica, said cement and silica being present in the mixture in finely divided form and in the proportions of 100 parts of cement to 30 to 90 parts by weight of silica.

17. A composition of matter adapted for use in the form of building slabs, sheets, shingles, pipes, and the like, said

composition being characterized by its relative high structural strength and resistance to corrosion and being composed essentially of the reaction product of partially setting in the absence of steam under pressure and then substantially completely curing in the presence of steam under pressure an intimate mixture including asbestos fibres, water, Portland cement and silica, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland Cement.

18. In making a cementitious composition, the method which includes forming a mixture comprising water, Portland cement, asbestos fibres and admixed finely divided silica, shaping the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to steam under super-atmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica being 30 to 90 parts silica to 100 parts Portland cement.

214 19. In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture accompanied with the application of pressure, subsequently applying additional pressure to the shaped mixture, then allowing the shaped and compressed mixture to take an initial set and partial cure, and subjecting the initially set material to steam under super-atmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement.

20. In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture accompanied with the application of pressure, then allowing the shaped mixture to take an initial set and partial cure, and subjecting the initially

set material to steam under superatmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement.

21. In making a cementitious composition, the method which includes forming a mixture comprising asbestos fibres, water, Portland cement, and admixed finely divided silica, shaping the mixture, subsequently applying pressure to the shaped mixture, then allowing the shaped and compressed mixture to take an initial set and partial cure, and subjecting the initially set material to steam under super-atmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica used being present in the proportion of 30 to 90 parts silica to 100 parts Portland cement.

The affidavit has been considered but is not seen to be persuasive. In the tests disclosed therein, the percentage composition was varied by varying the silica-cement ratio while maintaining the percentage of sand relative to the total mix constant. The result of this procedure in test I was to reduce the cement-sand ratio from 1:2 to 1:4. The sample having no silica, therefore, was a mixture having twice as much cement as the last sample having equal parts of
215 silica and cement. In view of this constant reduction of the amount of cement, a decrease in strength is to be expected.

Schumacher teaches that the addition of silica to a mixture of one part of cement to two parts of sand will increase the strength of the cured article. The patent does not suggest that the amount of Portland cement be decreased by an amount equal to that of the added silica. Applicants have not shown that the teaching of Schumacher does not result in an increase in strength of the product.

There is nothing in the data submitted which controverts the teaching of the Schumacher patent. The tests performed do not indicate that maximum strength of molded product having a fixed cement-sand ratio would not occur at a silica-cement ratio of 0.6. The tests submitted are not deemed to indicate that the coarse sand of Schumacher reacts with the cement and is more than an inert filler. In any event, to determine the optimum ratio of cement to silica by experiment is within the teaching of Schumacher.

The rejection of claims 5 and 13 to 17, as set out in the Supplemental Examiner's Statement of July 15, 1939, is still applicable to these claims.

Newly-added claims 18 to 21 are also met by the rejection set out against claims 5 and 13 to 17. The two-stage application of pressure recited in claims 19 and 21 is disclosed by Sanger (See lines 9 to 19, page 2).

This application is again forwarded for appeal on the basis of the rejection set out herein.

Respectfully,
B. HENKIN
Examiner, Div. 15.

* * * * * * * * * *

Decision of Board of Appeals, Mailed April 6, 1940.

Appeal No. 29,219

Hearing: March 20, 1940

In the United States Patent Office

Before the Board of Appeals

Ex parte Ernest Wayne Rembert

Application for Patent filed April 9, 1935, Serial No. 15,362. Cementitious Composition and Article and Method of Making the Same.

Mr. Virgil C. Kline for applicant.

This is an appeal from the final rejection of claims 5 and 13 to 21.

Claim 13 is representative of the subject matter involved.

13. In making a strong cementitious composition, the method which includes forming a flowable mixture compris-

ing water, asbestos fibres, Portland cement, and admixed finely divided silico, said cement and silica being present in the proportion of 100 parts of cement to 30 to 90 parts by weight of silica, shaping, strongly compressing, and removing excess water from the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to steam at a temperature above atmospheric.

The references relied upon are as follows:

Schumacher	1,003,813	Sep. 19, 1911
Sanger	1,223,834	Apr. 24, 1917

This application relates particularly to asbestos cement compositions of the type in which finely divided silica is mixed with the cement and the initially set product
240 partially cured with steam.

As broadly as above stated, we do not understand that appellant contends that there is any patentable novelty, at least he does not assert a claim as broad as this and the second paragraph of page 1 of the original specification tends, it is believed, to support this view. Also the patent to Schumacher clearly discloses the advantages of employing finely divided silica with cement when the product is submitted to the action of steam under pressure and Sanger teaches, in addition, the inclusion of asbestos fiber.

We recognize that the percentage of silica in Sanger is relatively small when compared with the amount employed by appellant and perhaps the disclosure of this patent is not of any great importance inasmuch as we believe, as above indicated, that appellant does not contend that there is any patentable novelty broadly in employing asbestos fibers with a finely divided silica cement mixture.

The feature referred to in the second paragraph of page 1 of the specification and urged in the brief by appellant, which apparently is regarded as his contribution, is the particular proportion of silica to cement, namely 30 to 90 parts of silica to 100 parts of Portland cement. A great deal of the discussion in the record and in the brief relates to appellant's contention that some of the sand in the Schumacher patent will react with the cement and therefore that the proportion of silica to cement is different in that patent from that which appellant urges is patentable.

It is our opinion, however, that the disclosure of
241 Schumacher on this point is not particularly important.
This patent clearly teaches the advantage of mixing finely divided silica with cement when steam curing is to be employed and it is thought that no invention was exercised in experimenting with a silica cement composition such as called for in claim 5 or a silica cement asbestos composition such as specified in the remaining claims and determining about what proportion of silica would produce the strongest product. This is especially true where the range of silica is as large as that claimed, namely, 30 to 90 parts of silica to 100 parts of cement.

It is our opinion, therefore, that appellant is not entitled to a practical monopoly on a particular type of cement composition which apparently he does not contend is patentable merely because he has conducted tests and determined the proper proportions to employ. It seems to us that any reasonably careful manufacturer would make routine tests of this nature.

The decision of the examiner is affirmed.

HENRY VAN ARSDALE
Assistant Commissioner

W. L. THURBER
Examiner-in-Chief

F. J. PORTER
Examiner-in-Chief
Board of Appeals

April 6, 1940.
Mr. Virgil C. Kline,
22 E. 40th St.,
New York, N. Y.

• • • • • • • • • •

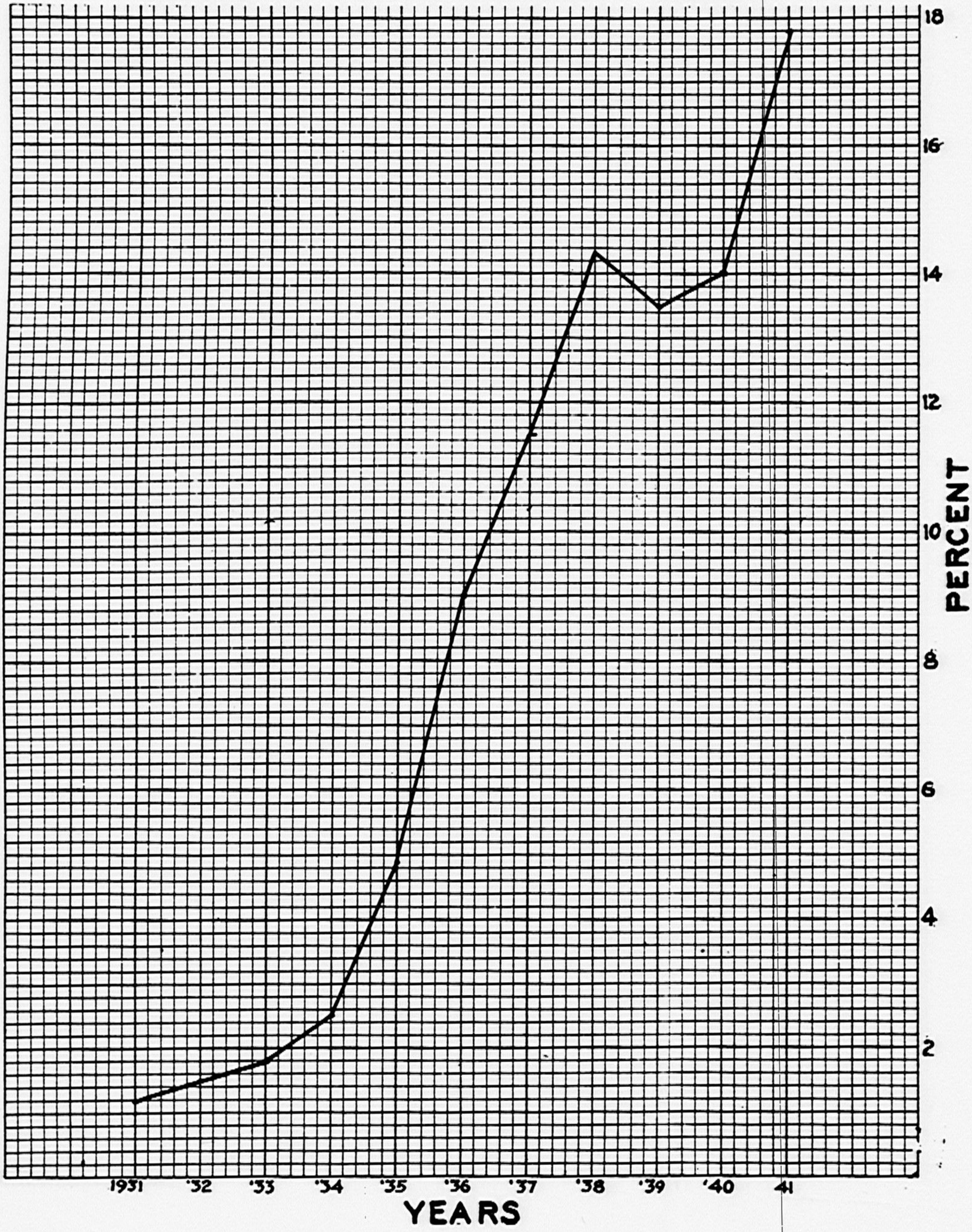
TABLE II.

TRANSVERSE STRENGTH TESTS OF NORMAL AND STEAM CURED TRANSITE

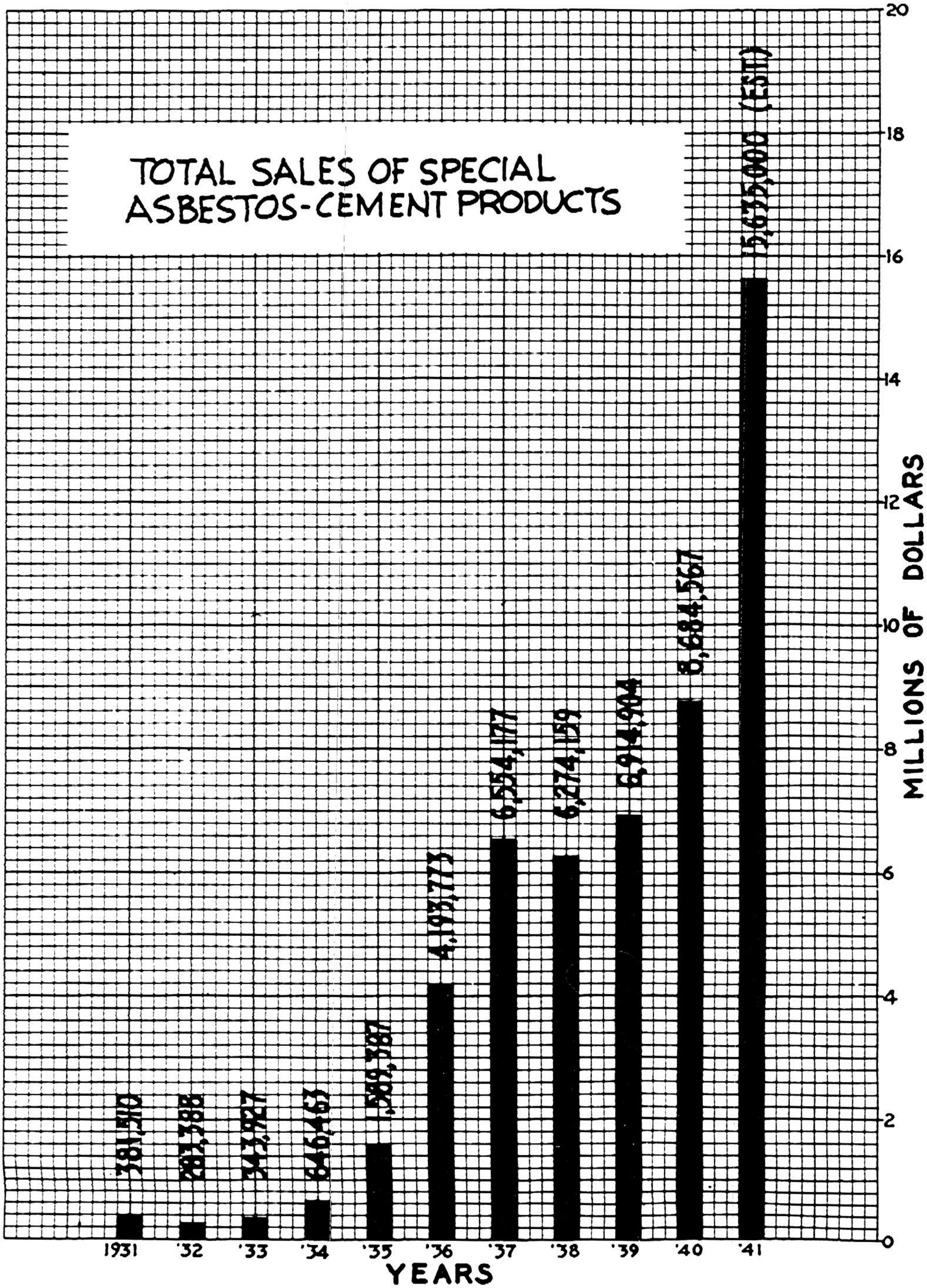
Test Series	Percent Composition of Sheets					Mod of Rupt lbs/sq in.		Curing Method			#200 Silica: P.C. Ratio SiO_2/P.C.
	6D28 Fiber	P.C.	#200 Silica	Ottawa Sand	-40 Banding Sand	Normal Cure	Steam Cured	Normal Days in Fog	Hrs. Precure	Hrs. in Steam	
I	40	60					2740		48	1	0.00
"	40	60					2580		48	3	0.00
"	40	60					2290		48	6	0.00
"	40	60					1790		48	12	0.00
"	40	60					1630		48	16	0.00
"	40	60					1450		48	24	0.00
II	40	60				3830	1500	28	48	48	0.00
"	40	50	10			3280	3755	"	"	"	0.20
"	40	45	15			2900	4455	"	"	"	0.33
"	40	40	20			2935	4640	"	"	"	0.50
"	40	37.5	22.5			2820	4820	"	"	"	0.60
"	40	35	25			2680	4865	"	"	"	0.71
"	40	30	30			2250	4115	"	"	"	1.00
III	40	50		10		3330	1420	28	48	48	0.00
"	40	45		15		3055	1425	"	"	"	0.00
"	40	40		20		2810	1300	"	"	"	0.00
"	40	37.5		22.5		2600	1350	"	"	"	0.00
"	40	35		25		2530	1410	"	"	"	0.00
"	40	30		30		2280	1405	"	"	"	0.00

PLAINTIFFS' EXHIBIT 12.

RATIO OF SPECIAL ASBESTOS-CEMENT PRODUCT SALES TO TOTAL COMPANY SALES

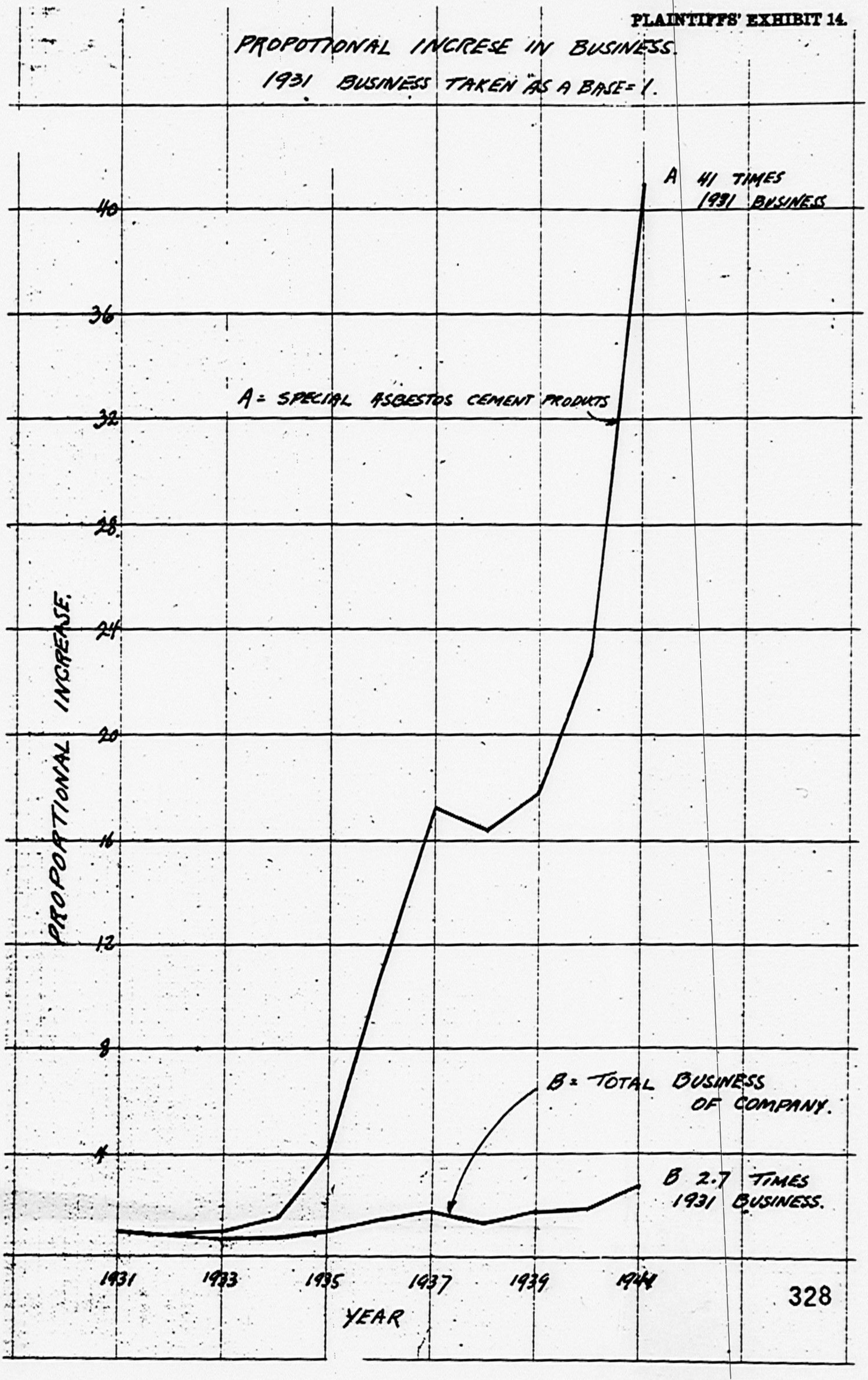


PLAINTIFFS' EXHIBIT 13.



TOTAL SALES OF SPECIAL ASBESTOS-CEMENT PRODUCTS

PLAINTIFFS' EXHIBIT 14.



PROPOTIONAL INCRESE IN BUSINESS.
1931 BUSINESS TAKEN AS A BASE = 1.

Tabulation Attached to Plaintiffs' Exhibit 14.

329 JOHNS-MANVILLE CORPORATION

SALES

Year	Total Sales	Sales of Special Asbestos-Cement Products
1931	32,385,000	381,510
1932	19,363,000	283,388
1933	19,686,000	343,927
1934	25,503,000	646,463
1935	32,789,000	1,589,387
1936	46,427,000	4,193,773
1937	56,945,000	6,554,177
1938	43,871,000	6,274,159
1939	51,161,000	6,914,904
1940	62,070,000	8,684,567
Estimated Total 1941	88,000,000	15,635,000

* * * * * * * * * *

UNITED STATES PATENT OFFICE.

WILHELM SCHUMACHER, OF OSNABRÜCK, GERMANY.

PROCESS OF INCREASING THE BINDING POWER OF BASIC SILICATES OF LIME.

1,003,813. Specification of Letters Patent. **Patented Sept. 19, 1911.**

No Drawing. Application filed May 31, 1906. Serial No. 319,510.

To all whom it may concern:

Be it known that I, WILHELM SCHUMACHER, chemist and subject of the King of Prussia, residing at Osnabrück, in the Kingdom of Prussia, German Empire, have invented a new and useful Improvement in the Process of Increasing the Binding Power of Basic Silicates of Lime, of which the following is a full, clear, and exact description.

It is known that by simply adding certain quantities of quartz powder of a fineness similar to that of cement to a standard mixture of one part Portland cement and two parts sand, the strength of the cement body or block obtained is increased. Of course, in this case no chemical action of the quartz upon cement takes place, but only a physical action. However, the effect of the addition of quartz powder can be greatly increased if the cement blocks are submitted to the action of steam under pressure, preferably after the solidifying or hydration of the cement. As known, on the hydration of the cement lime is set free, and it is this latter which, on being treated with steam combines with the added silica (quartz) to form silicate of lime, whereby the strength of the cement blocks is very considerably increased. By a great number of trials it has been established that the greatest strengths result if to the cement so much quartz powder is added, that the quantity of the latter together with the silica of the cement is approximately equal to the amount of lime. The most favorable addition of silica for each kind of cement can easily be found by way of experiment.

It is well known that if a fine sand is used in connection with cement, a greater amount of cement is necessary to form a block than when coarser sand is used. This is necessitated because of the greater amount of sand surface caused by the division into fine particles. I have found, however, that by adding a certain proportion of powdered quartz, a less amount of cement is necessary, than what was formerly required to bind together the particles of a cement block, while at the same time a much stronger block is made. It is believed that such result is obtained because of a chemical reaction between the cement and the quartz in the presence of steam under pressure.

Of course instead of the Portland cement any other basic silicate of lime, and particularly blast furnace slag may be used. In using this latter it is in many cases preferable to add small quantities of lime in order to expedite the hydration or solidification.

The addition of quartz powder is also useful in the manufacture of slag stones, that is, articles made from granulated blast furnace slag, when such articles are hardened by steam. Even if no trace of ground slag is used, the addition of fine quartz powder to the granular slag will greatly enhance the effect of the steam treatment and increase the strength of the product.

The addition of quartz powder to basic silicates of lime is of particular importance in those cases in which it is desired to obtain the greatest possible strength with a minimum of binding material, *e. g.*, the agglomeration of pulverulent ores (making of briquets), where, by the addition of binding means the ore is rendered impure and reduced in value.

Of course it is possible to add to the basic silicates of lime, besides the quartz powder, also other materials as used heretofore for certain purposes, for instance, lime, gypsum, asphaltum, stearin, etc.

What I claim is:

1. The process herein described of increasing the binding power of basic silicates of lime, which consists in adding thereto fine quartz powder, the total amount of silicate present in the mixture thus formed not to exceed the amount of lime, and subjecting the total mass to the action of steam under pressure.

2. The method herein described of increasing the binding power of basic silicates of lime, which consists in adding thereto fine quartz powder, the total amount of silicate present in the mixture thus formed not to exceed the amount of lime, and also adding thereto other materials such as lime, gypsum, asphaltum and stearin, and subjecting the entire mass to the action of steam under pressure.

3. The method herein described of increasing the binding power of basic silicates of lime which consists in adding quartz powder thereto, the total amount of silicate present in the mixture thus formed not to exceed the amount of lime, forming the mass in the blocks and subjecting said blocks to the action of steam under pressure.

4. The process herein described of increasing the binding power of basic silicates of

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from the original bound volume

lime, which consists in adding thereto lime and fine quartz powder, the total amount of silica present in the mixture thus formed not to exceed the total amount of lime present therein, and subjecting the resulting mass to the action of steam under pressure.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

WILHELM SCHUMACHER.

Witnesses:
FERDINAND REICH,
FREDERICK HOYERMANN.

UNITED STATES PATENT OFFICE.

WILLIAM SÄNGER, OF PASSAIC, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ASBESTOS SLATE ROOFING MANUFACTURING COMPANY, INCORPORATED.

ARTIFICIAL-STONE SLAB, SHINGLE, AND PLATE AND COMPOSITION FOR MAKING SAME.

1,223,834. Specification of Letters Patent. **Patented Apr. 24, 1917.**

No Drawing. Application filed August 30, 1915. Serial No. 48,072.

To all whom it may concern:

Be it known that I, William Sänger, a citizen of the German Empire, and a resident of Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Artificial-Stone Slabs, Shingles, and Plates and Composition for Making Same, of which the following is a specification.

This invention has reference to a novel process of making artificial stone slabs, shingles, plates and the like. It pertains particularly to a novel process of producing slabs and shingles for roofing purposes of a composition consisting essentially of asbestos fiber, hydraulic binding cement and anhydrous silica or as it is scientifically called silicon dioxid or silicium dioxid, and some water.

Heretofore compositions of this kind have been prepared from asbestos fiber and cements with additions of special waterproofing compositions or substances which unnecessarily increase the cost of production. Another composition contains fine quartz powder to increase the binding power of basic silicates of lime by subjecting the mass to the action of steam. Further sodium silicate has been treated with nitric acid to produce partly sodium nitrate and hydrated silica which is mixed with Portland cement, etc. The sodium nitrate certainly is useless in an artificial stone product. Other compositions result in artificial stone products which suffer from the defect of efflorescence. If the mixture contains calcium oxid and magnesium oxid then the finished product blossoms out under atmospheric influences. For instance

$$Ca(OH)_2+CO_2=CaCO_3+H_2O$$

whereby efflorescence is produced. Another composition speaks of colloidal cement. This expression appears not to be appropriate for a cement or similar mineral substance of composite character. Such composite materials can not be brought into a colloidal condition like gums, starch, gelatin or the ductile precious metals, since they never will be glue- or jelly-like because their composite character implies different specific gravities. Composite substances are not uniform as to physical condition and, accordingly can not acquire the state of being perfectly colloidal like gelatin or ductile like the precious metals. For these reasons cement can only be kept in suspension by great bulks of water for a limited period of time as the specifically heavier components act differently from the lighter ones. Great bulks of water make the production of an article tedious and increase the cost unnecessarily.

It is the special purpose of the present invention to avoid the described defects and to produce artificial stone, slabs, shingles, or plates by means of a very simple and inexpensive process which also results in a superior article. This has been primarily attained by preparing a composition of hydraulic binding cement, asbestos fiber and anhydrous silica. The addition of anhydrous silica, SiO_2, presents various advantages. It prevents efflorescence because it combines into calcium silicate or magnesium silicate with compounds like CaO and MgO nearly always present in any cementitious matter and which are acted upon by the atmospheric carbonic acid gas CO_2 under the formation of calcium carbonate or magnesium carbonate. These latter ingredients particularly have a very detrimental effect upon pressed cementitious materials inasmuch as they cause cracks within the finished goods and also decrease their tensile strength to a very high degree. The precipitated silica preferably employed therefore imparts a uniform character to the mass and gives the finished product the necessary elasticity at an increased tensile strength. The action of atmospheric water upon the finished articles will have no detrimental effect whatever upon them, but on the contrary the uncombined silica in the presence of water will further combine with the bases mentioned above while the simpler silicates may be transformed into more complicated silica compounds thus causing a further silification. The anhydrous silica remains in the finished shingles unchanged throughout except at the surface where a subsequent exposure to the atmosphere partly produces a silification of the surface portion.

The silica outside is only temporarily hydrated because it combines with lime and forms the insoluble calcium silicate.

The invention is carried into effect in substantially the following manner:

An intimate mixture is prepared of hydraulic binding cement, asbestos and anhydrous silica with a small quantity of water. The plastic mass obtained is then put into molds adapted to give the finished article the desired shape. In case of shingles I prefer to produce them each with a rectangular and a slanting longitudinal surface for the purpose of producing what the architects call a shadow line effect on the roof and to facilitate the laying. The mass, while in the hermetically sealed mold, is subjected to the pressure of compressed air. The shingles thus dehydrated and molded are subsequently subjected to high pressure, hydraulic pressure if desired and then the highly pressed article is treated with steam to effect the silification in the surface portion which finally results in the formation of silicate of calcium by combining with the lime of the cement.

The addition of anhydrous silica also presents the advantage of binding caustic bases such as lime which may occur in the cement or the mass. This in turn results in a better hardening of the product and increased tensile strength and the properties of being water and fire proof are also increased.

The proportions in which the various components are admixed may vary within reasonable limits especially on account of variations in the compositions of the cements. One formula which gives good results for most products is substantially as follows:

About 80 parts of cement are mixed with 15 parts of finely disintegrated asbestos and about 5 parts of anhydrous silica. A plastic mass is prepared from this dry mixture with only about twice its weight of water. The plastic mass is then worked up into shingles, plates, or slabs etc. in the manner herein described.

I claim as my invention:

1. A composition of matter for producing artificial stone slabs, shingles, plates and the like consisting of cement, asbestos fiber, chemically active precipitated anhydrous silica, and water, the said silica being adapted to effect the silification of the bases contained in the cement.

2. A composition of matter for producing artificial stone, slabs, shingles, plates and the like consisting of cement, finely divided asbestos fiber, chemically active precipitated anhydrous silica, and water, the said silica being adapted to effect the silification of the bases contained in the cement and to increase the strength and hardness of the composition in the course of time by forming insoluble silicate under the influence of atmospheric moisture and carbonic acid gas.

3. A composition of matter for producing artificial stone slabs, shingles, plates and the like consisting of cement, fine asbestos fiber, chemically active precipitated anhydrous silica and about twice the weight of the dry mass of water, the said silica being adapted to effect the silification of the bases of the cement.

4. A composition of matter for producing artificial stone slabs, shingles, plates and the like consisting of cement, fine asbestos fiber, chemically active precipitated anhydrous silica and about twice the weight of the dry mass of water, the said silica being adapted to effect the silification of the bases of the cement throughout the composition and of its surface portion by steam.

5. A composition of matter for producing artificial stone slabs, shingles, plates and the like consisting of hydraulic binding cement, fine asbestos fiber, chemically active precipitated anhydrous silica, and water, the said silica and free earthy basic oxids occurring in the surface portion of the composition being adapted to be hydrated by steam and to form insoluble earthy silicates from the hydrated substances.

6. A composition of matter for producing artificial stone articles consisting of about 80 parts of hydraulic binding cement, about 15 parts of finely divided asbestos fiber, about 5 parts of chemically active precipitated anhydrous silica, and about twice the weight of the dry mass of water, the said silica being adapted to effect the hydration of the silica and basic earthy oxids of the surface portion and to form insoluble earthy silicate.

7. As a novel product of manufacture an artificial stone article composed of hydraulic binding cement, fine asbestos fiber, precipitated anhydrous silica, and in which insoluble silicates of the earthy alkaline bases are produced in the surface portion when exposed to atmospheric moisture and carbonic acid gas.

8. As a novel product of manufacture an artificial stone article comprising about 80 parts of hydraulic binding cement, about 15 parts of finely divided asbestos fiber, about 5 parts of precipitated anhydrous silica, and in which insoluble silicates of the earthy alkaline bases are produced in the surface portion when exposed to the action of atmospheric moisture and carbonic acid gas.

Signed at New York, N. Y., this 24th day of August, 1915.

WILLIAM SÄNGER.

Witnesses:
HERMAN J. RUBENSTEIN,
LILLEY E. SCHMIDT.

70 Findings of Fact.

1. This is an action under Section 4915 R. S., U. S. C., title 35, sec. 63, in which plaintiffs seek to have the Court authorize the Commissioner of Patents to issue to them a patent containing claims 13, 14, 16, 18, 19, 20 and 21 of the application of plaintiffs Ernest W. Rembert and Edward M. Jenkins, No. 15,362, which was filed in the Patent Office on April 9, 1935, and entitled "Cementitious Composition and Article and Method of Making the Same".

2. The patent application here involved relates to a cementitious composition made of cement, finely divided silica, and asbestos fibres, and to the method employed in making the composition. In the claims it is stated that the cement and silica are present in the proportion of 100 parts of cement to 30 to 90 parts by weight of silica. The method is set forth in claim 18 as follows:

71 18. In making a cementitious composition, the method which includes forming a mixture comprising water, Portland cement, asbestos fibres and admixed finely divided silica, shaping the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to steam under super-atmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica being 30 to 90 parts silica to 100 parts Portland cement.

3. The claims which were refused by the Board of Appeals and which are properly before the Court in this action are claims 13, 14, 16, 18, 19, 20 and 21 as set forth in paragraphs 6 and 7 of the complaint. The claims in the form in which they are set forth in paragraph 9 of the complaint were presented in a proposed amendment to the application but entry of the amendment was refused and the Board of Appeals did not pass upon claims of this form.

4. According to the disclosure of plaintiffs' application the strength of a composition of Portland cement, finely divided silica and asbestos varies progressively as the pro-

portion of silica to Portland cement is progressively increased, and the greatest strength is obtained when the proportion of added silica to cement is somewhere between 40 and 60 parts of added silica to 100 parts of cement. There is nothing critical in the proportion set forth in the claims at bar, namely 30 to 90 parts of added silica to 100 parts of cement.

5. The patent to Schumacher, No. 1,003,813, September 19, 1911, discloses a process for increasing the strength of a body or block made from Portland cement and sand by adding finely divided silica to the mixture. The patent contains the following statements:

> 72 * * * By a great number of trials it has been established that the greatest strengths result if to the cement so much quartz is added, that the quantity of the later together with the silica of the cement is approximately equal to the amount of lime. The most favorable addition of silica for each kind of cement can easily be found by way of experiment.

It follows from the known composition of Portland cement, as set forth in plaintiffs' application, that Schumacher teaches the addition of about 44 parts of finely divided silica to 100 parts of Portland cement. This proportion is within the range claimed by plaintiffs. In the process disclosed by Schumacher the block, after it has preliminarily hardened, is subjected to the action of steam under pressure to cure the block and thereby increase its strength.

6. The Sanger patent, No. 1,223,834, April 24, 1917, discloses a process of making artificial stone slabs, shingles, plates and the like. The articles are made of a composition consisting of asbestos fibre, cement and finely divided silica. The proportions used are said to be about 5 parts of silica to 80 parts of cement. In the process the asbestos fibre, cement, silica and water are mixed together, the mass is placed in a hermetically sealed mold and subjected to pressure to mold it and remove excess water, the molded article is then subjected to high pressure, and later treated with steam to harden it.

7. It was not invention, in view of the Sanger patent, to use asbestos fibres in place of the sand in the composition disclosed in the Schumacher patent.

8. It was not invention to increase the proportion of silica specified in the Sänger patent to a proportion within the range set forth in plaintiffs' claims, in view of the teaching of the Schumacher patent.

73 9. Nothing recited in plaintiffs' claims amounts to an invention over the prior art.

Conclusions of Law.

1. Plaintiffs are not entitled to a consideration by the Court of the claims set forth in paragraph 9 of the complaint.

2. None of the claims set forth in paragraphs 6 and 7 of the complaint is patentable and plaintiffs are not entitled to receive a patent containing any of said claims.

3. The complaint should be dismissed with costs against the plaintiffs.

DANIEL W. O'DONOGHUE,
Dec. 18-1941 *Justice.*

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Judgment.

This cause having come on to be heard and having been tried in open court and argued by counsel for the respective parties upon the pleadings and proofs adduced and submitted to the Court,

It is Adjudged this 18 day of December, 1941, that the complaint in this case be, and the same hereby is dismissed with costs against the plaintiff.

DANIEL W. O'DONOGHUE,
Justice.

Approved as to Form:
C. W. FAIRBANK
Attorney for Plaintiff.

75 *Notice of Appeal to U. S. Court of Appeals for the District of Columbia*

Notice is hereby given that Ernest W. Rembert, Edward M. Jenkins, and Johns-Manville Corporation, Plaintiffs, above named, hereby appeal to the U. S. Court of Appeals for the District of Columbia from the final judgment entered in this action on December 18, 1941.

LEE B. KEMON
Attorney for Appellants
Ernest W. Rembert, Edward
M. Jenkins and Johns-Manville
Corporation
LEE B. KEMON
1331 G Street, N. W.
Washington, D. C.

Memorandum

JANUARY 16 1942
$250 deposited in lieu of cost bond on appeal.

AND APPENDIX
BRIEF/FOR APPELLEE

In the United States Court of Appeals for the District of Columbia

No. 8185

ERNEST W. REMBERT, ET AL., APPELLANTS

v.

CONWAY P. COE, COMMISSIONER OF PATENTS, APPELLEE

APPEAL FROM THE JUDGMENT OF THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF COLUMBIA

W. W. COCHRAN,
Solicitor, United States Patent Office,
Attorney for Appellee.

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Authorities Cited:

Abbott et al. v. *Coe*, 109 F. (2d) 449, 71 App. D. C. 195 4
Arness, In re, 95 F. (2d) 344, 25 C. C. P. A. 997 12
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In the United States Court of Appeals for the District of Columbia

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APPEAL NO. 8185

ERNEST W. REMBERT, ET AL., APPELLANTS

v.

CONWAY P. COE, COMMISSIONER OF PATENTS, APPELLEE

APPEAL FROM THE JUDGMENT OF THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF COLUMBIA

BRIEF FOR THE COMMISSIONER OF PATENTS

INTRODUCTION

This is an appeal from the judgment (89)[1] of the District Court of the United States for the District of Columbia dismissing a complaint (1) brought by appellants to obtain a patent. The patent application, Serial No. 15,362, was filed in the Patent Office by appellants Rembert and Jenkins, on April 9, 1935, and it relates to a cementitious composition and a method of making it from Portland cement, finely divided silica, asbestos fibers, and water.

Claims 13, 14, 16, 18, 19, 20 and 21 of the application are here involved (3, 4, 5). The Patent Office and the lower court held these claims unpatentable in view of the Schumacher patent, No. 1,003,813 (83) and the Sänger patent, No. 1,223,834 (85).

APPELLANTS' APPLICATION

The subject matter of appellants' application is essentially a method of making the cementitious product. Although claims 14 and 16 (3) are, in form, claims for a composition of matter, they are obviously drawn in terms of the method of making the composition. These claims will therefore not require separate treatment but may be considered along with the method claims.

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[1] The numbers in parentheses refer to pages of Appellants' Appendix.

The method claims 13, 18, 19, 20, and 21 (3, 4, 5) do not differ greatly in scope. Claim 18, which is considered to be typical and clearly sets forth the method, reads as follows:

> 18. In making a cementitious composition, the method which includes forming a mixture comprising water, Portland cement, asbestos fibres and admixed finely divided silica, shaping the mixture, then allowing the mixture to take an initial set and partial cure, and subjecting the initially set material to steam under superatmospheric pressure, to cause interaction of the silica with the basic components of the cement and harden the product, the ratio of admixed silica being 30 to 90 parts silica to 100 parts Portland cement.

The composition is said to be suitable for the making of shingles, pipes, etc.

SUMMARY OF ARGUMENT

I. The use of 30 to 90 parts of silica with 100 parts of Portland cement, which is called for by the claims, which range of proportions appellants contend is critical, was not recited in either the specification or claims of the application as it was filed in the Patent Office. In view of this circumstance and other circumstances in the prosecution of the application appellants are not entitled to contend now that the stated range of proportions is a critical one.

II. The Schumacher patent teaches the use of approximately 44 parts of fine silica with 100 parts of Portland cement in the making of a cementitious material for the purpose of increasing the strength of the material. This proportion is within the 30–90 range claimed by appellants.

III. The Sänger patent discloses the use of 6¼ parts of silica with 100 parts of cement in a composition consisting of these materials and asbestos fibre. This ratio of silica to cement is outside of the 30–90 range claimed by appellants, but since both Sänger and Schumacher teach the use of silica to strengthen the composition, it required no invention, but only experimentation, to ascertain that a greater amount of silica would give greater strength. Moreover, Schumacher teaches the use of a greater amount of silica.

IV. The tests made by appellants were not tests of the materials and proportions set forth in the Schumacher and Sänger patents. Nor did these tests include a test at either of the end points at the alleged critical range of 30 to 90 parts of silica to 100 parts of cement. The tests were therefore not material evidence on the question of patentability of the appealed claims over the prior patents.

V. The claimed range of proportions is not critical, because the properties of the product change only in degree and not in kind when the claimed range is departed from.

ARGUMENT

I. The claimed proportions of ingredients

Appellants' application (47) as filed in the Patent Office shows in Figure 2 of the drawing (57) a curve which is said to represent the strength of the composition as the proportion of silica to Portland cement is varied. The values given extend from about 3 parts of silica to 100 parts of cement, at one end of the curve, to about 107 parts of silica to 100 parts cement at the other end of the curve. According to the curve the maximum strength of the composition, 4,000 lbs. square inch, is attained if about 53 parts of silica are used with 100 parts of cement. Of the thirteen claims presented with the application as filed only claim 3 (Appellee's Appendix 1) recited any definite proportion of silica to cement and that claim specified six-tenths part by weight of silica to one part of cement, i. e., 60 parts of silica to 100 parts of cement. This is close to the value 53 which, according to the appellants' curve, would give the strongest product. None of the original claims specified a range of proportions.

Appellants stated in their application as filed (50) that "the silica ratio is preferably 0.4 to 0.6 part to 1 of cement," and also (54) "The proportion of admixed silica to Portland cement should be kept within close limits. There may be used approximately a half part of silica for one part of cement."

Notwithstanding these statements, appellants amended their application on September 18, 1936, about a year and a half after it was filed, by inserting in the specification and certain claims a ratio of 15 to 100 parts of silica to 100 parts of cement. (Appellee's Appendix 1.) Finally, on April 16, 1938, three years after the application was filed, appellants amended claim 13 by specifying the range now claimed as critical, i. e. 30 to 90 parts of silica to 100 parts of cement, and presented claim 16 (3) specifying this range. (Appellee's Appendix 2.) The specification does not even yet mention this range.

While the application as filed sets forth in Fig. 2 (57) the results of appellants' investigations involving the use of various proportions, extending over and beyond the 30–90 range, the fact that this range was neither mentioned nor claimed precludes appellants from contending now that it is a critical range.

The 30–90 range of proportions is no doubt a useful range, because compositions made with proportions falling within the range include the compositions of greater strength, according to appellants' Figure 2. However, the same can be said for 40–60 range initially specified in the application, and the 15–100 range later specified and claimed. But even if appellants were now able to demonstrate as a result of investigations made after their application was filed, that the 30–90 range is critical in certain compositions, that fact if established now cannot, since the range was not mentioned or claimed, retroactively entitle appellants to rely on the range as being critical. (See *Abbott et al.* v. *Coe,* 109 F. (2d) 449; 71 App. D. C. 195.)

II. The Schumacher patent

The Schumacher patent, No. 1,003,813, of September 19, 1911, (83) relates to a process of increasing the binding power of lime silicates by adding fine quartz powder thereto. There is no contention by appellants that fine quartz powder is not finely divided silica.

The patent discloses that by adding finely divided silica to 1–2 cement-sand mixture the strength of the resulting mortar body would be increased (83, lines 10 to 19). The patent also states (83, lines 29 to 35):

> * * * By a great number of trials it has been established that the greatest strengths result if to the cement so much quartz powder is added, that the quantity of the latter together with the silica of the cement is approximately equal to the amount of lime.

From this statement it follows that the patent teaches the addition of about 44 parts of finely divided silica to 100 parts of Portland cement, as will now be shown.

The formula for conventional Portland cement as given in appellants' application (49) is:

Ingredient:	*Parts by Weight*
Silicon dioxide (Silica), SiO_2	19.4
Aluminum oxide, Al_2O_3	7.2
Ferric oxide, Fe_2O_3	3.0
Calcium oxide (quicklime) CaO	63.6
Magnesium oxide, MgO	3.4
Sulphur trioxide, SO_3	1.8

From the above quoted statement it is clear that the amount of quartz powder which is to be added is together with the 19.4 parts of silica already present equal to the amount of lime, i. e. 63.6 parts. It follows that according to the patent 44.2 parts of quartz powder are added to the cement. Since the total of all the parts given in the cement formula is 98.4, the amount of quartz powder added to 100 parts of cement would be somewhat over 44 parts.

It is to be noted that this proportion of added, fine silica to cement is well within the claimed 30–90 range and is near the proportion which according to appellants' Figure 2 would give a maximum strength to the composition.

Moreover it is stated in the patent (83, lines 35 to 38) that "the most favorable addition of silica for each kind of cement can easily be found by way of experiment."

The steps of allowing the mixture to take an initial set and then subjecting it to steam under pressure is clearly disclosed in lines 19 to 23 and in lines 39 to 54 of the patent.

Thus the Schumacher patent meets the claims on appeal except that it does not disclose the use of asbestos in the composition, although it does recite the use of other materials such as gypsum, asphaltum, stearin, etc. (lines 79 to 83).

As will be shown the Sänger patent discloses a similar composition in which asbestos fibre is incorporated and in view of this patent the lower court found as a fact (89) that it was not invention to use asbestos fibres in place of the sand in the composition disclosed in the Schumacher patent.

III. The Sänger patent

The Sänger patent, No. 1,223,834, of April 24, 1917 (85), relates to the making of artificial stone slabs, shingles, and plates and to the composition of which they are made. The composition consists of asbestos fibre, cement, and silica. These are the same ingredients as appellants use for making the same products. The proportion of silica to cement is given as 5 to 80 (86, lines 33 to 35). This is equivalent to 6¼ parts of silica to 100 parts of cement. While this is outside of the claimed 30–90 range of silica to 100 parts of cement, it is submitted that since the patent teaches (85, line 90) that the silica is added to increase the strength, only experimentation or a following of the teaching of the Schumacher patent was involved in increasing the amount of silica to that recited in the appealed claims.

The procedure followed in making the composition as set forth in appellants' claims is substantially the same as the procedure prescribed in the Sänger patent. This will be evident from a comparison of appellants' claim 18 with the following quotation from the patent (85, beginning in line 109):

> An intimate mixture is prepared of hydraulic binding cement, asbestos and anhydrous silica with a small quantity of water. The plastic mass obtained is then put into molds adapted to give the finished article the desired shape. In case of shingles I prefer to produce them each with a rectangular and a slanting longitudinal surface for the purpose of producing what the architects call a shadow line effect on the roof and to

> facilitate the laying. The mass, while in the hermetically sealed mold, is subjected to the pressure of compressed air. The shingles thus dehydrated and molded are subsequently subjected to high pressure, hydraulic pressure if desired. and then the highly pressed article is treated with steam to effect the silification in the surface portion which finally results in the formation of silicate of calcium by combining with the lime of the cement.
>
> The addition of anhydrous silica also presents the advantage of binding caustic bases such as lime which may occur in the cement or the mass. This in turn results in a better hardening of the product and increased tensile strength and the properties of being water and fireproof are also increased.
>
> The proportions in which the various components are admixed may vary within reasonable limits especially on account of variations in the compositions of the cements.

Concerning this patent appellant Rembert gave the following testimony (36. 37):

> Q. Now will you consider the Sanger patent. No. 1,223,834? In what respects do you consider that your method, and your product, distinguishes from the disclosure of Sanger?
>
> A. In the first place, our process is a commercially practical process, whereas the process as disclosed by Sanger is not; in other words, it is not practical to operate using a formula he proposes that will reduce the strength of the product to less than half of that obtained on normal curing.
>
> Q. There is a distinction, then, between his process and your process which brings about that difference?
>
> A. Yes, sir; that is true.
>
> Q. What is that difference?
>
> A. We don't know exactly. It depends on how Sanger has interpreted it. The one thing that we are certain of, however, is the fact that the proportion of

silica which we use is much greater than is suggested by Sanger.

Q. Can you think of any other difference between the two?

A. Any other difference would be presumptious.

It thus appears that the appealed claims distinguish from the Schumacher patent only by specifying the use of asbestos fibres in the composition, and that the claims distinguish from the Sänger patent only in the amount of silica used in the composition. It is submitted that neither of these differences is a patentable one, for the Sänger patent would suggest the use of asbestos fibres in the Schumacher composition and the Schumacher patent would suggest the use of more silica in the Sänger composition.

IV. Reply to appellants' brief

Appellants argue that their composition and method involve the use of three factors which if used individualy produce disadvantageous results, and that therefore in using these three factors they have proceeded contrary to the teaching of the prior art and consequently have made an invention.

The three factors are set forth in appellants' brief, page 19.

The first factor is that appellants are said to have gone contrary to accepted knowledge and theory that pressure steam curing reduces the strength of an asbestos cement mixture. This is not material because the patents to Sänger and Schumacher do not relate merely to mixtures of asbestos and cement. Both specify the addition of silica, just as appellants' do.

The second factor is that adding fine silica in any amount in the *standard* process of making asbestos-cement products decreases the strength. By standard practice appellants apparently mean ordinary curing as distinguished from steam curing. This is also immaterial because both Sänger and Schumacher cure with steam, and the latter specifies steam under pressure, and this is what appellants do.

The third factor concerns the amount of silica which is added. The statement that appellants employed a higher ratio than had ever been suggested is inaccurate as far as the appealed claim is concerned, because, as has been pointed out, Schumacher teaches the use of 44 parts of silica to 100 parts of cement.

The statements made in appellants' argument are based on the tests set forth on pages 59 and 77 of appellants' appendix. Upon examination it will be found that none of these tests was of the materials and proportions specified in the Schumacher and Sänger patents. The nearest approach to the Schumacher proportions is found in line 4 of Test Series I (59). This test was of a composition made of 23.3 parts cement, 66.7 parts sand, and 10.0 parts silica. The proportion of silica to cement is about 43 to 100 which approximates the 44 to 100 ratio disclosed by Schumacher, but ratio of cement to sand is approximately 1 to 3 and not 1 to 2 as specified by Schumacher (83, lines 14, 15).

The testimony of appellant Rembert (23, 36) was to the effect that with a 1-to-2 cement-sand mixture the amount of added silica which would give the strongest composition is 25 parts of silica to 100 parts of sand and not 44 parts silica to 100 parts sand as Schumacher teaches. This testimony is based on the tabulation (59) and curve (61). The particular test is the third under Test Series I. But in this test the cement-sand proportion is 26.7 to 66.7, which is 1 to 2.5 and not 1 to 2 as Schumacher specifies. It is submitted that this testimony is therefore without weight as to the Schumacher disclosure.

None of the tests shown on page 59 of appellants' appendix relates to a composition containing asbestos. It is obvious, therefore, that none of the tests relates to the Sänger composition.

Nor do any of the tests of asbestos-cement-silica compositions given on page 77 of appellants' appendix correspond even roughly to the composition consisting of 80 parts cement, 15 parts asbestos, and 5 parts silica specified in the Sänger patent (86, lines 33 to 35).

It should also be noted that none of appellants' tests was of a composition having either 30 or 90 parts of silica to 100 parts of cement. Thus there is no showing of the proportions of the composition at the end points of the range which is claimed to be critical.

These tests may prove something as to the strength of certain compositions made by normal curing and steam curing. They prove nothing as to the compositions made in the proportions and in the manner set forth in the Schumacher and Sänger patents.

V. The claimed range of proportions is not critical

It would seem evident from the strength curve shown in Figure 2 of appellants' application that the claimed range of 30 to 90 parts of silica to 100 parts of cement is not critical, for the strength of the composition varies gradually and smoothly as the proportion of silica to cement is varied. There is no sudden change when either 30 or 90 parts of silica is used with 100 parts of sand. On the contrary when these proportions are used the strength differs only very slightly from the strength resulting from the use of nearby proportions.

The decision of this Court in *Becket* v. *Coe,* 98 F. (2d) 332, 69 App. D. C. 51, on which appellants rely, does not support their contentions. In that case this Court found "evidence that the proportions named by Becket are critical; in other words, that substantial departure from his proportions will result in failure to achieve the alloy of his invention." That is not the case here. Having regard for appellants' disclosure in Fig. 2, they cannot contend the use of 20 parts silica to 100 parts of cement, or 95 parts silica to 100 parts of cement would result in failure. Such a contention if made would be inconsistent with the claims specifying 15 to 100 parts of silica to 100 parts of cement, which appellants made in their application on September 18, 1936. (Appellee's Appendix 1.)

The question whether invention is involved in varying the known proportions of a composition has been before the courts in numerous cases. The general rule seems to be that invention may be involved if by changing the proportions a new product is made whose properties differ in kind and not just in degree from the proportions of the old product.

Thus in *Brady Brass Co.* v. *Ajax Metal Co.,* 160 Fed. 84, the Court said:

> "* * * There is no evidence to show that there is an absolute and sudden change at this precise so-called 'critical point' of 7 percent of tin and more than 20 percent of lead. On the contrary, the weight of the testimony is all to the effect that the change in conditions is gradual in approaching this point. * * * There is no 'critical point,' on one side of which there is an absolutely bad product and on the other side an absolutely good product."

In *David Belais, Inc.* v. *Goldsmith Bros. Smelting & Refining Co.*, 10 F. (2d) 673, the Court said:

> * * * An alloy never mixed before may effect so startlingly new a result as to arrive at even pioneer invention (*American Stainless, etc. Co.* v. *Ludlum, etc., Co.* [C. C. A.], 290 F. 103); but ordinarily the rule is that it is the invention of what is new, and not the attainment of comparative superiority or greater excellence in that which was already known, that amounts to patentable invention (*Smith* v. *Nichols,* 21 Wall. 112, 22 L. Ed. 566).
>
> Applying this to alloys, a "mere difference in the proportions of the constituents of an alloy, however useful the result may be, is not patentable, where the result was reached gradually by experimentation, and the final product differs from those of the prior art only in degree." *Brady, etc. Co.* v. *Ajax Co.,* 160 F. 84, 87 C. C. A. 240.

The United States Court of Customs and Patent Appeals in *In re Richter,* 53 F. (2d) 525, 19 C. C. P. A. 756, stated:

> There are authorities, such as *Minerals Separation, Limited, et al.* v. *Hyde,* 242 U. S. 261, 234 O. G. 1311, supporting the principle that a change in proportions of agents in a combination analogous to the cooking liquor here involved may at times be inventive, but in all such cases the changed proportions must be critical as compared with the proportions used in prior processes, producing a difference of kind rather than of degree.

To the same effect were the Court's decisions in

> *In re Lilienfeld,* 67 F. (2d) 920, 21 C. C. P. A. 792, and
> *In re Arness,* 95 F. (2d) 344, 25 C. C. P. A. 997.

CONCLUSION

For the reasons stated above it is submitted that the composition having the claimed proportions is not patentably different from the compositions disclosed by the Schumacher and Sänger patents, that the range of proportions claimed by appellants is not critical, and that appellants, on the basis of their application as filed, are not entitled to contend that the claimed range is critical.

It is therefore submitted that the judgment of the lower Court dismissing the complaint should be affirmed.

W. W. Cochran,
Solicitor, U. S. Patent Office,
Attorney for Appellee.

May 1942.

APPELLEE'S APPENDIX

ORIGINAL CLAIM 3

3. A composition of matter comprising the product of pressure-steam-curing a mixture of castable consistency
94 of Portland cement, water, asbestos fibres, and admixed finely divided silica, the proportion of admixed silica being approximately six-tenths part by weight to one part of Portland cement.

AMENDMENT OF SEPTEMBER 18, 1936

In response to Official Action of March 31, 1936, please note and amend as follows:

Page 5. Line 4, after "cement." insert the following sentence.—For some purposes the proportion of admixed silica may be varied between 15 and 100 parts of the
113 cement, the advantageous effect upon the strength of the product of silica in this proportion, as well as in the preferred proportion, being illustrated in the graph of Fig. 2.—

* * * * * * *

Claim 2. Lines 4 to 7, cancel everything after "admixed silica" to the end of the claim and insert therefor—being approximately 15 to 100 parts by weight to 100 parts of the Portland cement.—

* * * * * * *

Add the following claim:

14. A composition of matter comprising an intimate mixture of Portland cement, asbestos fibres, and finely
114 divided admixed silica, the proportion of the cement being in excess of the proportion of asbestos, the admixed silica being in the proportion of 15 to 100 parts by weight to 100 parts of the cement, the said composition being

in compressed and hardened condition, and the said silica being largely chemically reacted with basic components of the cement.—

AMENDMENT OF APRIL 16, 1938

In response to Official Action of October 18, 1937, please note and amend as follows:

135 Claim 13, line 4, after "silica," insert—said cement and silica being present in the proportion of 100 parts of cement to 30 to 90 parts by weight of silica,—

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REPLY BRIEF FOR APPELLANTS.

IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA.

October Term, 1941.

No. 8185.

ERNEST W. REMBERT, et al.,
Appellants,

v.

CONWAY P. COE, Commissioner of Patents,
Appellee.

Appeal from the District Court of the United States for the District of Columbia.

CLAIR W. FAIRBANK,
VIRGIL C. KLINE,
Of Counsel for Appellants.

Lee B. Kemon,
Solicitor for Appellants.

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IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA

October Term, 1941.

No. 8185.

Ernest W. Rembert, Edward M. Jenkins, and
Johns-Manville Corporation,
Appellants,
v.
Conway P. Coe, Commissioner of Patents,
Appellee.

Appeal from the United States District Court
For the District of Columbia.

REPLY BRIEF FOR APPELLANTS.

Appellee's brief, in effect, admits that neither of the two references before the District Court and relied upon by the appellee, discloses appellants' invention. It does not deny that they are mere paper patents, taken out by German subjects, and which never benefited the industry. It does not deny that the Sanger patent marked a step backward in the art. It does not challenge the statement of "facts, as the industry knew them," as set forth in our main brief, pages 12 and 13. It does not question the very great advance which has been made in the art by appellants or the enormous commercial success which has been achieved due to the utilization of the invention and by following appellants' teachings.

As appellee's brief tends to confuse, rather than clarify, the issue here involved, it is thought that the Court may be assisted by a short reply brief answering appellee's arguments as listed in the summary (p. 2) but putting the last one first.

I. The Critical Character of the Ratio Defined (Solicitor's Point V, p. 3).

The use of 30 to 90 parts of finely divided silica with 100 parts of cement would not be critical or even preferred in a *sand-cement* product with either normal curing or pressure steam curing. In such a product the highest strength is obtained with 25 parts of fine silica to 100 parts of cement with pressure steam curing, as pointed out in our main brief (App. 21, last A). This is outside of appellants' range (App. 22, first A). The use of that ratio in an asbestos-cement product with normal curing would not be critical, and in fact, the use of any fine silica whatever would be undesirable. The fact that such ratio in such products would not be critical has nothing to do with the issue here before the Court, but makes it even more surprising and unexpected that it is critical in appellants' product.

The record clearly establishes that that ratio *is critical* in appellants' invention, namely with an asbestos-cement mixture cured by steam under pressure. The use of any mixture of fine silica and cement within that ratio and with asbestos, regardless of the method of curing, is not disclosed in the prior art. It was new with appellants, was disclosed in appellants' application as filed, and has been responsible for the great commercial success and benefit to the industry, which have been achieved.

We have pointed out the error of the District Court in its Finding of Fact No. 4 and the meaning of the term "critical" in our main brief, pages 31 to 33.

We accept the definitions of "critical point" as used or applied in the decisions cited in appellee's brief, page 11.

In *Brady Brass Co.* v. *Ajax Metal Co.*, 160 Fed. 84, the Court defined the critical point as that point

> "on one side of which there is an absolutely bad product and on the other side an absolutely good product" (p. 90).

In *David Belais, Inc.* v. *Goldsmith Bros. Smelting & Refining Co.*, 10 F. (2d) 673, the Court held there was no invention in merely attaining

> "comparative superiority or greater excellence" (p. 675)

or in differing from the prior art

> "only in degree" (p. 675).

In *In re Richter*, 53 F. (2d) 525, this Court held that the changed proportions, to be critical, must produce

> "a difference of kind rather than of degree" (p. 527)

Between "bad" and "good" there must be a standard, or a basis for comparison. In any patent case that standard for comparison might well be the best product which the prior art taught how to make. A "bad product" is therefore one which is not so good as could be produced by known prior art procedures, and a "good product" is one which is better than could be produced following the prior art teachings. A bad product and a good product differ in *kind* and not in *degree*. They are on opposite sides of the standard. One of two good products may have comparative superiority or greater excellence in respect to the other, but the latter must have some superiority or excellence in respect to the standard of comparison or there can be no relative degree of merit.

The best asbestos-cement the prior art knew how to produce must be accepted as the basis of comparison. That was made of asbestos and cement without any added fine silica, and normally cured. A standard test bar or briquette of that product will rupture when subjected to a strain of 3830 pounds per square inch (R. 77, Test Series II, col. 7, line 1). Any similar bar of *lesser* strength is absolutely bad and a step backward in the art, whereas a similar bar of greater strength is absolutely good and is to be desired.

If that test bar with no added silica and which had a strength of 3830 pounds per square inch had been steam cured for one hour, it would have been absolutely bad, because the strength would have been only 2740 (Test Series I, col. 8, line 1). Progressively increasing the length of time of steam curing would progressively decrease the strength until the strength was only 1450 for 24 hour curing, as pointed out in our main brief, page 6. Therefore steam curing was something to be avoided.

If that same test bar which had a strength of 3830 pounds per square inch had been made with added fine silica in the ratio of 10 parts of silica to 50 parts of cement (20 to 100) and normally cured, it would have been absolutely bad because the strength would have been only 3280. Progressively increasing the ratio of fine silica to cement gives progressive decreases in strength. Table II, Test Series II, columns 3, 4 and 7 (R. 77) shows this decrease with normal curing.

Ratio of Added Silica to Cement						*Breaking Strength*
0 to 60	or	0	to	100		3830
10 to 50	"	20	"	100		3280
15 to 45	"	33.3	"	100		2900
20 to 40	"	50	"	100		2935
22.5 to 37.5	"	60	"	100		2820
25 to 35	"	71	"	100		2680
30 to 30	"	100	"	100		2250

The first line with no added fine silica and a breaking strength of 3830 was the best the prior art knew. The others with added fine silica have no comparative or any other kind of excellence and no relative superiority. They have only comparative badness or greater inferiority. Therefore the adding of fine silica to an asbestos-cement mixture and normally curing gave bad products, and was something to be avoided. Furthermore, with normal curing there is nothing critical in the ratio of cement to fine silica. Any addition of fine silica is bad and the more added the worse the product, this being true despite the erroneous statement in the Sawyer patent that a small proportion of anhydrous silica with normal curing of an asbestos-cement product is advantageous.

The foregoing facts, namely (a) that any steam curing of an asbestos-cement product is bad and is to be avoided; and the longer the product is steam cured the worse the product, and (b) that any addition of fine silica to an asbestos-cement mixture and normally curing is bad, and the more the silica the worse the result, are not disputed.

We come now to the present invention and the question as to whether or not the stated ratio of admixed silica to cement in an asbestos-cement mixture steam cured is "critical" in the sense in which that term is used in the reported cases.

We have pointed out that a standard test bar of asbestos and cement with neither added silica nor steam curing had a strength resisting breaking up to 3830 lbs. per sq. in. In Table II, Test Series II, (App. 77), in the column headed "Steam Cured", there are given the following data obtained by varying the amount of *added silica* to an asbestos-cement mixture and *pressure* steam curing for 48 hours.

Ratio of Added Silica to Cement	*Breaking Strength*
0 to 60 or 0 to 100	1500
10 to 50 “ 20 “ 100	3755
15 to 45 “ 33.3 “ 100	4455
20 to 40 “ 50 “ 100	4640
22.5 to 37.5 “ 60 “ 100	4820
25 to 35 “ 71 “ 100	4865
30 to 30 “ 100 “ 100	4115

From this table it will be seen that with no added fine silica and with pressure steam curing, the strength was very low, and with a fine silica to cement ratio of 20 to 100, it was still below the standard of comparison, namely 3830, obtained with the normal curing with no added fine silica. These were bad products.

When the ratio was increased to 15 to 45 (that is 33.3 to 100) the product went from bad to good, as the strength of 4455 exceeded the standard of comparison, 3830. As the ratio increased from this critical low limit, the strength progressively increased until the ratio was somewhere above 71 to 100 and then there was a sharp drop in the strength as the ratio of fine silica was further increased.

Thus a *small* amount of finely divided silica added to an asbestos-cement mixture and steam curing gives a bad product because it is not as good as the prior art taught how to obtain, and the same is true of a *large* amount. Appellants discovered something that was not known or even suggested by the prior art, namely that somewhere between that bad small amount and that bad large amount there was an amount that gave very markedly superior results over anything that could be obtained or had been obtained in the prior art. A strength of over 4800 was obtained with a silica to cement ratio of 60 to 100 against the prior art best of only about 3830. The specification, as filed, said (App. 50)

> "The silica ratio is preferably 0.4 to 0.6 part to 1 of cement."

That is between 40 to 100 and 60 to 100.

Obviously, where a small amount or a large amount is bad and an intermediate amount is good, there must be some limits defined for that intermediate amount. The proper low limit is where the product changes from bad to good and the high limit to where it again changes; this time from good to bad. Those are the critical ratios as shown in the drawings and supported by the specification as originally filed herein.

From the above table it will be seen that the low critical ratio is between 20 to 100 and 33⅓ to 100. Other tests indicate it to be about 30 to 100 and that is the low ratio defined in the claims here in issue.

From the above table it would appear that the high critical ratio is about 100 to 100, but in the high range the drop in strength is very steep, and from other tests, and to be entirely on the safe side, appellants have determined that the high critical ratio is slightly lower, namely 90 to 100, and that is the high ratio defined in the claims here in issue.

Therefore the Patent Office Solicitor goes directly contrary to the evidence when he contends that there is nothing critical in the proportion set forth in the claims at bar, namely, 30 to 90 parts of added silica to 100 parts of cement. The claims do define a critical ratio and are clearly patentable under the rulings of this and other Courts referred to in our main brief.

II. The Application as Filed Discloses that Ratio (Solicitor's Point I, p. 2).

Appellee's brief charges that the critical range of proportion was not recited in either the specification or claims of the application as it was filed in the Patent Office. The fact is that such critical range of proportions was disclosed in the *drawing* of the application and Rule 70 provides that either the drawing or specification may be changed to correspond to the other. The Solicitor does not suggest that new matter has been added to the case since it was filed.

The data used in plotting the curve shown in Fig. 2 of the drawing of the application (App. 57) were obtained from a somewhat different series of test bars and where the prior art asbestos-cement test bar without added silica and normally cured, was of such size that it had a breaking strength of about 3450 pounds per sq. in. instead of the 3830 of the bars used in making Table II (App. 77) hereinbefore discussed.

From Fig. 2 (App. 57) it will be seen that the breaking strength for different ratios of fine silica to cement in an asbestos-cement mixture with pressure steam curing was as follows:

Ratio of Fine Silica to Cement	*Breaking Strength About*	*Character*
0.1 to 1 or 10 to 100	1750	bad
0.2 to 1 or 20 to 100	2800	bad
0.3 to 1 or 30 to 100	3500	critical point
0.4 to 1 or 40 to 100	3800	good
0.5 to 1 or 50 to 100	4000	best
0.6 to 1 or 60 to 100	3950	good
0.7 to 1 or 70 to 100	3800	good
0.8 to 1 or 80 to 100	3700	good
0.9 to 1 or 90 to 100	3450	critical point
1.0 to 1 or 100 to 100	3200	bad

Thus the application as filed disclosed that the low ratio or critical point, where bad went to good, that is, where the breaking strength exceeded that of the prior art and reached 3450, was approximately 30 to 100. It was best at 50 to 100, which is the middle of the preferred range stated in the specification as between 0.4 to 1 and 0.6 to 1 (App. 50). The high ratio or critical point, where good went back to bad (because the breaking strength was down again to 3450) was 90 to 100.

As the drawing of the application thus disclosed the defined range for the ratio of fine silica to cement, applicants, under the Rules of Practice and the established procedure of the Patent Office, had the right to amend the specification to conform to the drawings. The original specification stated (App. 50) last paragraph, that the ratio is preferably 0.4 to 0.6 of silica to 1 of cement.

Appellants made a large number of tests from which the curve of Fig. 2 (App. 57) was prepared. The points where that curve crosses and recrosses the breaking point strength of 3500 clearly establish the range of the silica to cement ratios which are critical in that they define the field wherein appellants' product is a step forward rather than a step backward in the art.

III. The Teaching of the Schumacher Patent (Solicitor's Point II, p. 2).

What this patent teaches applies only to sand-cement mixtures. It does not state any specific amount of fine silica to be added. It says that the proper amount of fine silica for a sand-cement mixture can be calculated from the lime of the cement or that it can be found by experiment (App. 83, lines 35-38). Appellants have made those experiments and found that for a standard mortar mix, having 2 part sand 1 part cement, the amount of added fine silica which gave the maximum strength is such that the silica to cement ratio is 25 to 100. For a weaker mix, 3 part sand to 1 part cement, the amount of fine silica to be added to obtain maximum strength is much lower, the ratio of silica to cement being 10 to 100 (App. 23).

The Patent Office Solicitor has computed the ratio to be 44 to 100 and on that computation argues that Schumacher's ratio is within appellants' range. The erroneous statement on which the computation is based is entitled to no weight. It is a pure accident that this ratio is useful with a different composition, asbestos-cement, about which Schumacher showed no knowledge and as to which he made no suggestion.

The proper way to interpret a patent is to follow its instruction and ascertain the result, rather than make mathematical computations based on data obtained from sources outside of the patent. Schumacher clearly teaches a fine silica to cement ratio for sand-cement mixtures outside of and below what appellants discovered to be the range of ratios for asbestos cement mixtures.

IV. The Teaching of the Sanger Patent (Solicitor's Point III, p. 2).

Appellee's brief (pp. 7 and 8) quotes from the testimony of Dr. Rembert relating only to the fine silica-cement ratio disclosed in Sanger. The following should also have been quoted from the same testimony and in regard to the curing procedure disclosed in Sanger:

> "Do you find any reference to using steam under pressure greater than the atmosphere in the Sanger patent? A. No.
>
> "Q. Then would you say that Sanger discloses the use of steam curing in the sense in which you have defined it in this case? A. We would presume that

> Sanger does not use steam curing in the sense we have defined it, because he certainly would not have considered a process as practical which would result in a decrease of greater than half the normal cured strength.
>
> "We presume that he has reference to a practice used in Europe of simply curing cement products in an atmosphere of saturated air which is maintained saturated by the injection of steam" (App. 37, lines 7 to 20).

Sanger discloses employing 6¼ parts silica to 100 parts cement. Thus Sanger lacks both the ratio and the pressure steam curing of appellants' invention, and teaches how to make a worthless product.

V. Tests of Sanger and Schumacher Products (Solicitor's Point IV, p. 3).

Appellee's brief charges that appellants did not test the materials and proportions set forth in the Schumacher and Sanger patents or at the exact end point of the critical range.

Appellants did test Schumacher, and established that the teaching of that end point was false and that the ratio of fine silica to cement in a 3 to 1 sand-cement mixture to obtain maximum strength is 10 to 100. It is up to 25 to 100 with a richer (2 to 1) mixture (App. 23) and not 44 to 100 as computed and referred to in Appellee's brief (p. 5).

They did establish beyond all possible doubt that the results obtained from testing sand-cement mixtures gave no basis whatever for predicting what would happen with an asbestos-cement mixture, as was pointed out in our main brief (pp. 5 to 7), and that Schumacher's best range of fine silica to cement, if used with asbestos-cement and pressure steam curing would give a bad product, namely, one weaker than the commercial asbestos-cement normally cured product with no added fine silica.

Appellants did test Sanger and showed that it marked a step backward in the art (App. 26). Sanger uses the equivalent of 6¼ parts of silica to 100 parts of cement, (Appellee's brief, p. 6), which is .06 to 1. Appellants' drawing (App. 57) shows a dot on the curve at about the .06 point; that is about two-thirds of the way to the 0.1 vertical line. That was a test of Sanger's mixture with pressure steam curing and shows a breaking strength of about 1600 as against a strength obtainable by normal prior art practice without silica, of about 3450. The test shown by the appellants' drawing (App. 57) was with appellants' *pressure* steam curing even though Sanger does not disclose that method of curing. Table II (App. 77) also shows that with normal curing and using Sangers ratio of 6¼ to 100 the strength would have been about 3650 which is below 3830 (where no added silica is used) and above the 3280 (where the silica to cement ratio was 10 to 50 or 20 to 100).

CONCLUSION.

It is submitted that the brief of the Solicitor for the United States Patent Office has shown no justification for the ruling of the District Court. The judgment of that Court should be reversed.

Respectfully submitted,

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